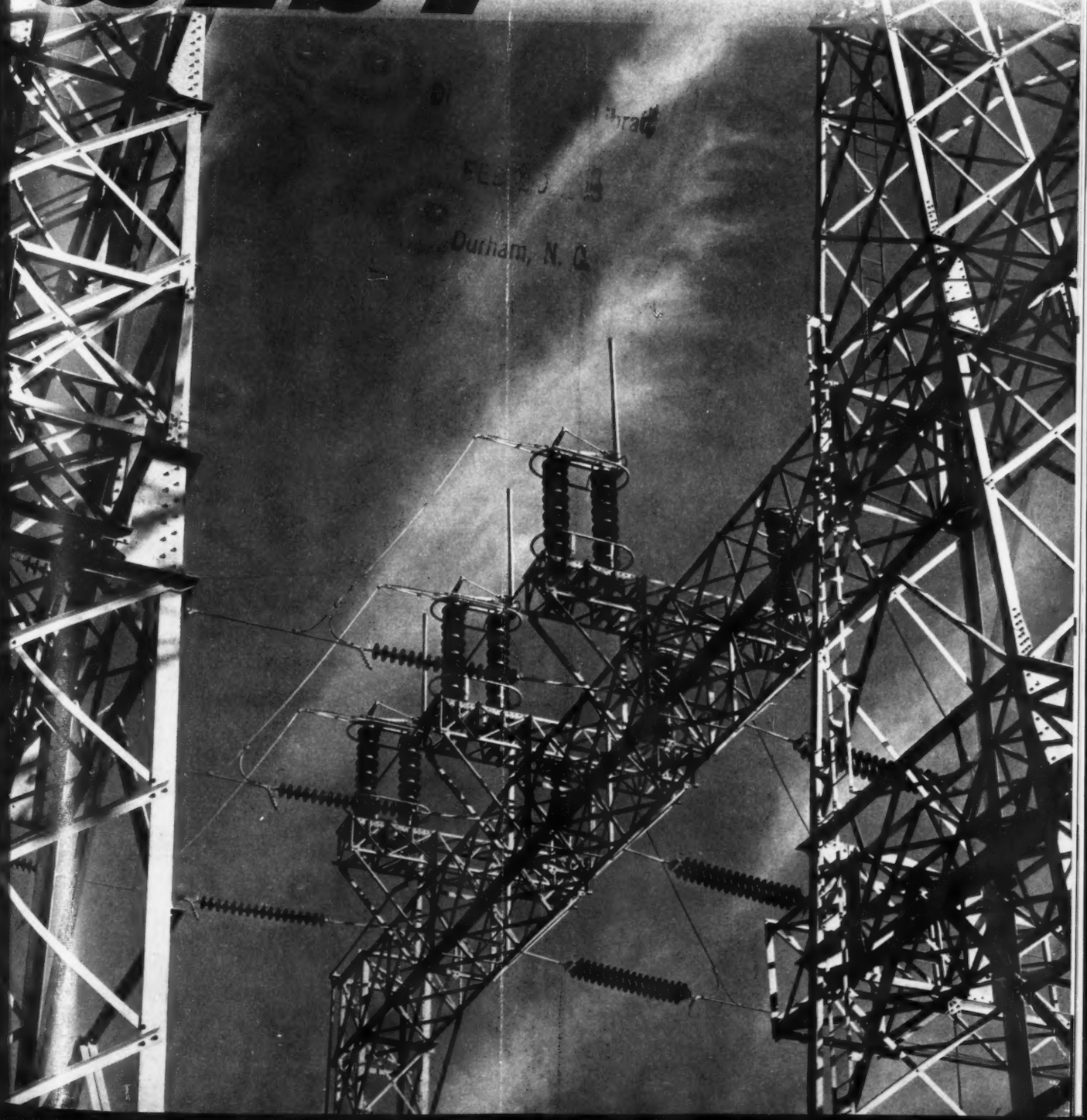
24TH ANNUAL REVIEW & FORECAST • FEBRUARY 1943 • 25c

ELECTRICAL WEST

2-23-43

THE ALL-INDUSTRY MAGAZINE OF PROGRESS



Durham, N. C.

It's coming—the *real* age of electrical living. It will be here after victory is won . . . when American industry can use its great productive capacity and war experience to make peace time products again.

A big share of those post-war products will be electrical — new and improved appliances to bring the people of this nation better, easier living than ever before.

Adequate wiring will be an essential part of every modern home, to make possible the fullest use of electrical appliances.

Now is the time to start planning for tomorrow's building opportunities . . . and to start thinking and talking in terms of all-electrical living.

Keep "adequate wiring" well in mind . . . it will be in every contractor's future home-building plans.

CERTIFIED ADEQUATE RED SEAL STANDARD WIRING

SOUTHERN CALIFORNIA EDISON COMPANY LTD.

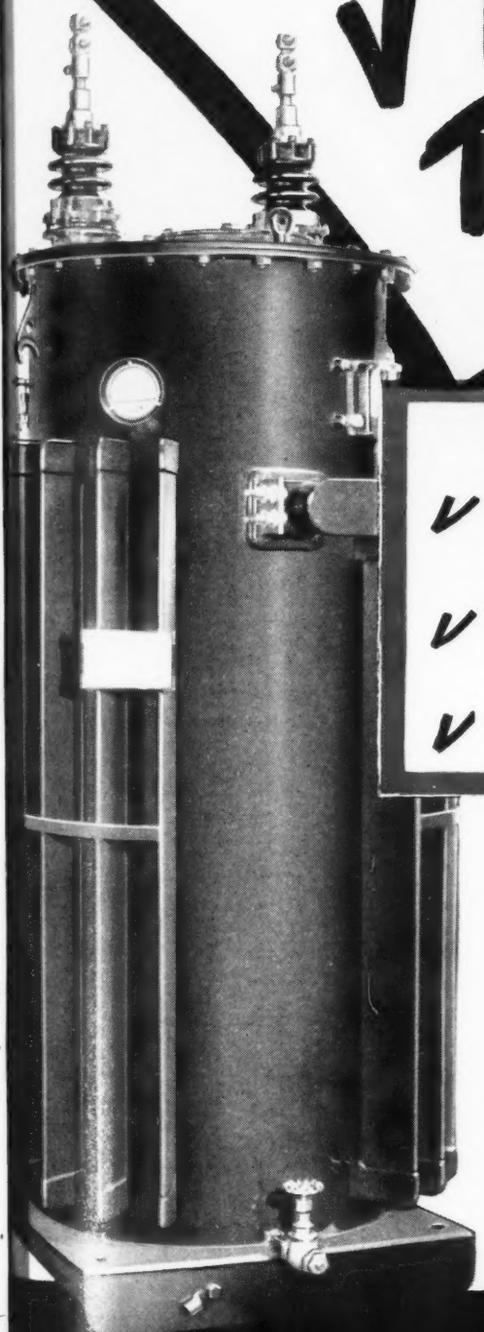
ELECTRICAL WEST (with which is consolidated The Journal of Electricity), February, 1943. Vol. 90, No. 2. Published monthly by the McGraw-Hill Company of California, 68 Post Street, San Francisco, Calif. Entered as second class matter at the post office at San Francisco under the Act of March 3, 1879. Additional entry as second class matter at the post office at Los Angeles. Printed in U. S. A. Subscription rate in U. S. and U. S. possessions, and Canada, $2 per year; all other countries $3 gold (thirteen shillings). Single copy 25c.
Copyright, 1943. McGraw-Hill Company of California.

Add Them to Your Check List of Safety Measures

✓ Fire-alarm Systems
✓ Fire Walls
✓ Sprinkler Systems

✓ Pyranol Transformers

. . . Because Pyranol Cannot Burn



FROM THAT ONE FACT SPRING MANY BENEFITS:

✓ YOU CAN INSTALL THEM INDOORS *SAFELY:* No Pyranol transformer has ever burned or contributed to a fire. Even if heat from a surrounding blaze ruptures the tank, the fire hazard will not be increased.

✓ VAULTLESS INSTALLATIONS ARE POSSIBLE: You can install them indoors or outdoors in the basement, on the factory floor, on overhead beams, or on the roof. Such flexibility assures you major savings in time, floor space, and construction materials.

✓ PRIMARY POWER CAN BE RIGHT AT THE LOAD: Voltage regulation is improved, line losses are lowered, copper is saved—often up to 30,000 lb in large industrial installations.

AND BECAUSE THEY ARE *LIQUID-FILLED* THEY HAVE:

✓ — —A HIGH, *LASTING* DIELECTRIC STRENGTH—an important safeguard against damage from voltage surges caused by lightning and switching

✓ — —PRESSURE-TIGHT TANKS, which protect vital parts from dust, dirt, and sabotage

✓ — —A HEAT-STORAGE CAPACITY that is ideal for emergency overloads

PYRANOL* transformers fit naturally into your wartime campaigns for (1) safety, (2) stepped-up production, and (3) conservation of critical materials.

The absence of fire hazard will help you with campaign No. 1. A reliable power supply, easily installed *where you want it*, is an important consideration for No. 2. Fireproof vaults being unnecessary, vital construction materials are saved. Since Pyranol transformers can be located at the load center, the runs of secondary copper are greatly reduced. These are important factors in helping you with point No. 3.

Since the introduction of Pyranol, in 1932, more than 4,000,000 kva of new transformers have been built using this type of cooling and insulating liquid. Hundreds of users are finding that Pyranol transformers assure the lowest total installed cost commensurate with the highest degree of safety.

Ask your G-E representative for the complete story, or write for Bulletin GEA-2048D. *General Electric Company, Schenectady, N. Y.*

**Pyranol is the G-E trade name for askarel.*

The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in six plants manufacturing naval equipment

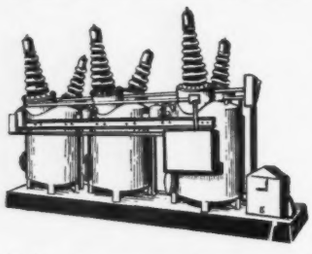
GENERAL ELECTRIC

Here in the WEST

People

Authors

To single out individuals from the large group of executives, engineers, commercial managers and league executives who contributed to the main sections of this issue would be inappropriate and unfair. This current review of the status of the industry is a cooperative job, wherein the editors seek the



help of a group who respond to the last man. So to the following individuals, the editors bespeak the thanks of the whole industry for a contribution which limns clearly the part the industry is playing in the war effort.

Power and War

E. H. Aiken . . . Henry Alderman . . . V. C. Armstrong . . . Paul P. Ashworth Frank Baxter . . . J. C. Boyle . . . Walter Brenton . . . Malcolm Bridgewater . . . Paul M. Brown . . . P. Diederich . . . L. K. Doutrick . . . Guy W. Faller . . . L. B. Fuller . . . H. C. Gardett . . . L. W. Grayson . . . R. H. Halpenny . . . D. K. Hamilton . . . S. O. Harper . . . N. B. Hinson . . . E. R. Hoffman . . . V. B. Jones . . . L. M. Klauber . . . O. D. Lanning . . . O. L. Lefever . . . M. G. Lord . . . J. W. McArthur . . . J. H. McCambridge . . . G. McClellan . . . L. C. McClurkin . . . Frank McLaughlin . . . L. H. Parker . . . M. A. Pooler . . . Arthur Prager . . . F. L. Roe . . . J. E. E. Royer . . . Capt. Roy W. Scheufele . . . H. H. Schoolfield . . . Henry L. Senger . . . Allyn A. Walters . . . F. H. Wiley . . . A. V. Youens.

Repairs

G. A. Baxter . . . G. B. Buck . . . J. Clark Chamberlain . . . A. S. Cummins . . . B. F. DeLanty . . . J. T. Deppe . . . P. Diederich . . . O. R. Doerr . . . H. E. Farris . . . B. W. Fields . . . R. E. Gale . . . L. G. Gray . . . Victor W. Hartley . . . C. E. Hess . . . A. E. Holloway . . . W. A. Huckins . . . T. W. Hughes . . . D. B. Leonard . . . J. W. McArthur . . . Allen G. McBride . . . R. B. McElroy . . . R. C. McFadden . . . A. C. McMicken . . . J. C. Plankinton . . . A. L. Pierce . . . Oscar Rostad . . . Charles Snyder . . . P. C. Spowart . . . M. C. Truman . . . E. E. Walker . . . D. B. Wheelock.

Pages

Second Year of War 51
Western power plants and personnel have met the challenges of war. Facts about the past year and predictions for the year to come.

Power Goes to War 54
Wartime needs govern most construction programs. In 1942 Western utilities spent $73,000,000: Federal agencies $74,000,000.

Now It's Repairs 72
Results of liquidation of appliance stocks during 1942; estimates on dealer mortality, utility loads, sales work, advertising programs.

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Cover: USBR photo of Grand Coulee switching yard.

Preview

Censorship

Editors are limited today as to what can and cannot be printed. Although the censorship is voluntary, there are a few rules imposed by the OWI. Key test is this question: "Is this information I would like to have if I were the enemy?" So, if some articles seem slightly sketchy, if maps are omitted entirely, if pictorial treatment is not all that might be expected, then consider such omissions as sacrifices occasioned by the war.

Power Plant

The aforementioned remarks on censorship apply to an article dealing with a new U. S. Bureau of Reclamation plant recently completed. Technical details of this installation (which must be nameless for the present) will be incorporated in an article next month.

Merchandising

Opportunities for sales promotion are not totally obscured by the war. Take the matter of War Bonds for instance. All of the old fashioned sales techniques which in the past sold household appliances, as well as some new fangled ideas, can be used to sell bonds to em-

ployees. By applying sound campaign procedure, the Los Angeles Bureau of Power & Light won both the Treasury Department Minute Man flag and the coveted "T", which means that more than 90% of all employees are subscribing more than 10% of the total pay roll for War Bond purchases. Just how this was achieved will be told in an article which can guide other utility corporations.

Directory

The wartime stock situation and the need for emergency wartime repairs makes ELECTRICAL WEST's annual MANUFACTURER'S DIRECTORY more valuable than ever this year. This up-to-the-minute handbook on local suppliers of nationally distributed products will be published in April. Work of compiling it is now under way.

FOR HIGH ACHIEVEMENT

AT THE TURN OF *"A CENTURY OF SERVICE"*

Coincident with the Award of the Army-Navy "E" for Excellence and Outstanding Achievement in Production, we're entering our second century of service. For 100 years Hubbard Hardware has been dependably carrying the load.

With our entry into this war, our battle lines were extended to the production lines. The demand for war materials became the greatest the world has ever known. In the tradition of past generations of Hubbard employees we accepted our duty and went to work turning out those items so vital and essential to our fighting forces — expecting no recognition for our efforts. In receiving this honor for work "well done," we can therefore appreciate that it's not easily won nor lightly bestowed. We realize that to keep it, we must keep on earning it. We're working for an Allied Victory that will find us in business at the end of our "second century of service."

HUBBARD

Hubbard and COMPANY

OAKLAND, CAL. PITTSBURGH CHICAGO

HUBBARD

HANG THE LOAD ON HUBBARD HARDWARE

Get On The with HOTPOINT

THE BOND WAGON

BUILD BACKLOG OF POST-WAR BUYING POWER

PATRIOTIC ACCUMULATION PLAN

CONTRIBUTE TO POSTWAR PROSPERITY AND EMPLOYMENT

HELP WIN THE WAR

CREATE CONFIDENCE IN THE FUTURE

BUY BOMBERS TODAY — BUNGALOWS TOMORROW

A GREAT NEW WARTIME PROMOTION PROGRAM

THE SLOGAN "Buy War Bonds Today — Electric Kitchens Tomorrow" not only stimulates the sale of War Bonds, but creates confidence in the future that will build a backlog of post-war consumer demand. The purchase of bonds will also assure the funds with which people can buy the products of peace.

In Hotpoint's new plan book is described the entire program replete with the "Home Planning File," the year's great wartime promotional idea, direct mail, newspaper, etc. Plan now to "Get On the Bond Wagon." Help your government in the war effort today and help build up post-war prosperity and peacetime employment.

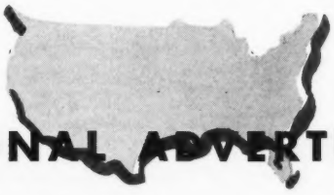
REFRIGERATORS
RANGES
WATER HEATERS
WASHERS AND IRONERS
CLOTHES DRYERS
AUTOMATIC DISHWASHERS
ELECTRASINK
STEEL CABINETS

Buy War Bonds Today—

Hotpoint

BOND WAGON in 1943

Last Year's Outstanding Wartime Advertising Theme To Be Greatly Expanded in 1943



NATIONAL ADVERTISING

Hotpoint's wartime advertising program launched in national magazines during 1942 was enthusiastically received by utility companies, large retailers, official Washington. Hotpoint will not only continue the program but will expand it in 1943 with four-color advertisements in *Life, Collier's, Ladies' Home Journal, American Home, Better Homes & Gardens, House Beautiful* and *Bride's Magazine*—PLUS . . .

LOCAL ADVERTISING PLANS

Here is a program you can use now—for your spring activity. The 1943 Plan Book tells how you can use Hotpoint's War Bond advertising theme in your own newspaper advertising, and in customer contacts. Plan now to include the BOND WAGON PROGRAM in your 1943 promotional activities. See your Hotpoint distributor or factory representative. Edison General Electric Appliance Co., Inc., 5616 W. Taylor St., Chicago, Ill.

NEW FARM ADVERTISING

Special color pages in *Country Gentleman* and *Farm Journal*, America's two leading farm papers, will be used in 1943 to help support the government's War Bond Program for farmers, and help build a post-war farm market for Hotpoint Electric Kitchens. *Electricity on the Farm* will also carry regular pages. End of war will find American farmers prosperous buyers and excellent prospects for modern electrical equipment.

HOME PLANNING FILE

Vastly successful in local promotions during 1942, Hotpoint's novel Home Planning File offers more opportunity than ever. Hotpoint national advertisements will feature this handy file for keeping clippings and ideas of the homes your customers plan to build after the war. Include this in your local promotion program for 1943.

SCRAP IS POWER
YOU HELP
. . . the War Effort
. . . Your Customers and Yourself
. . . when you Salvage, in accordance with your Manufacturer's Instructions, all inoperative parts containing . . .
CRITICAL MATERIALS
Cooperate with your industry! Put vitally needed scrap back into the Scrap
TODAY!

Electric Kitchens Tomorrow!

ELECTRIC KITCHENS

'E' Award
Thermador Electrical Co. Wins Flag
The Army-Navy "E" production banner is the possession today of the Thermador Electrical Manufacturing Co., the organization thus joining the select company which has achieved recognition for excellence in the war effort.
Rear Admiral J. R. Defrees, retired, made the presentation address.
"During 1942, my office inspected the products of approximately 2600 contractors, the majority of whom did excellent work, but of this large number only six were awarded this flag by the Navy," he said.
"You men and women on the production line spotted the enemy a 5-year-lead, and wherever you have not already passed him, you are hot upon his heels."
Officers Discuss War Work With Consul
ARMY
NAVY

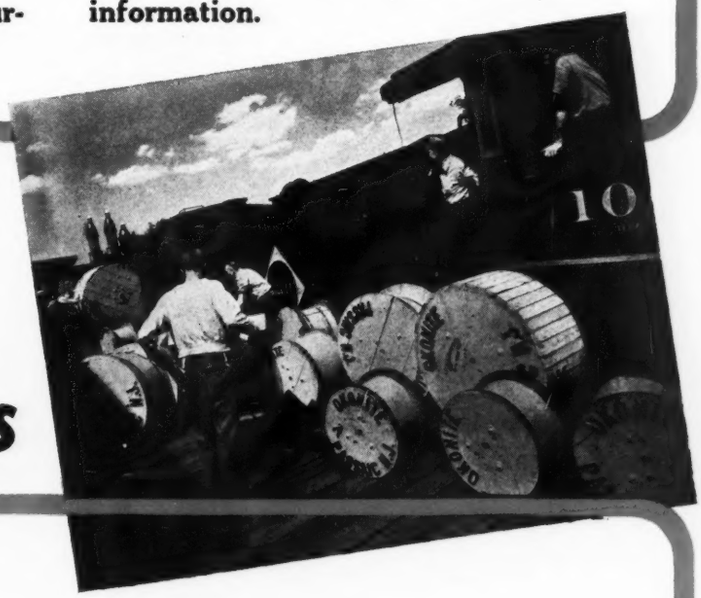
THERMADOR ELECTRICAL MFG. COMPANY

5119 South Riverside Drive, Los Angeles, California

DO:

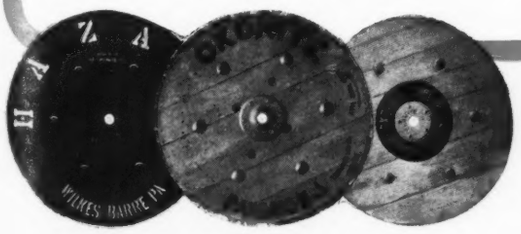
- order your wire requirements as far in advance as possible, to allow time to apply for material allocations from the War Production Board. Consult with government engineers to check with their requirements before purchasing cable for a *governmental financed project.*
- avoid complicated splices and fittings. Your Okonite representative can tell you how to simplify installations.
- supply us with cutting lengths promptly as we cannot start manufacture, in most cases, until we have this information.

To Expedite Shipment of Wires and Cables



DON'T:

- specify cables that are unnecessarily complicated. Each operation on a cable requires special machines, any one of which may be cause of delay. Keep your cable design simple. Consult your Okonite representative as to how you can do this.
- order short lengths of many sizes. Standardization on a few sizes almost always results in lower cost per foot and much quicker delivery.
- send your order in without specifying End Use, conditions of installation, preference rating, priority authorization, army, navy or other governmental contract number, if any. This information is necessary in order to secure permission to manufacture.



3190

THE OKONITE COMPANY
THE OKONITE-CALLENDER CABLE CO., Incorporated
HAZARD INSULATED WIRE WORKS DIVISION
Executive offices, Passaic, N. J. • Branch offices in principal cities

Salvage Your Scrap — Buy U. S. War Bonds

HERE'S THE COMING THING NEW ELECTRO-COOLER THAT ALLIS-CHALMERS POWER

★ New Allis-Chalmers ELECTRO-COOLERS can step up capacity of most transformers now in service by as much as 60%! Installation is simple, quick, inexpensive!

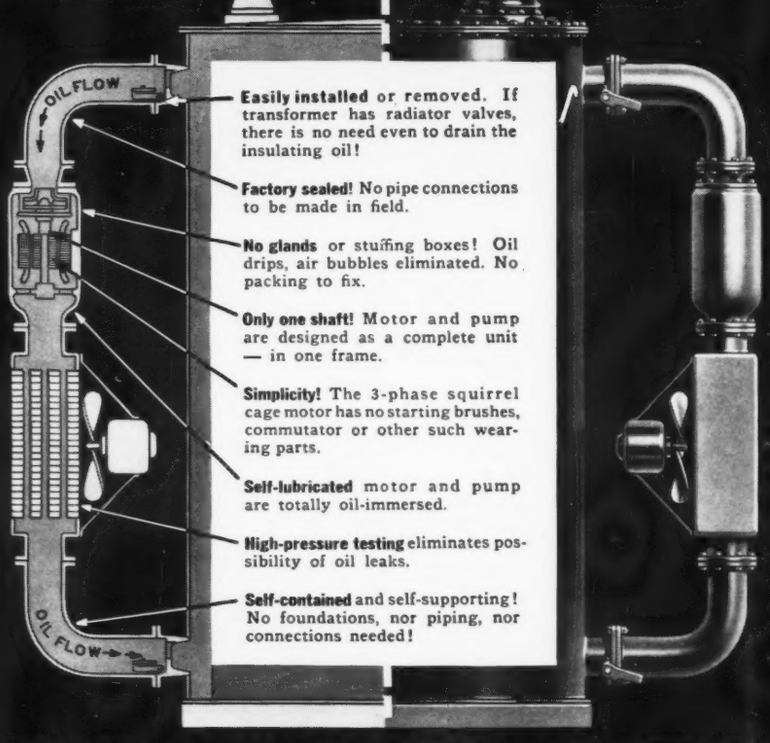
★ The new ELECTRO-COOLER is self-contained and self-supporting ... employs no stuffing boxes ... is self-lubricating. Here's forced-oil cooling at its finest ... a sound long-term investment.

★ New transformers built with ELECTRO-COOLERS use 25% less copper and steel than formerly ... cost correspondingly less!

★ When ELECTRO-COOLERS are put on existing transformers, up to four times their own weight in scrapped radiator steel is saved for other essential war uses.

★ This entirely new unit is not to be confused with adaptations of air conditioning devices.

Highlights of New Electro-Cooler


OIL FLOW
OIL FLOW
Easily installed or removed. If transformer has radiator valves, there is no need even to drain the insulating oil!
Factory sealed! No pipe connections to be made in field.
No glands or stuffing boxes! Oil drips, air bubbles eliminated. No packing to fix.
Only one shaft! Motor and pump are designed as a complete unit — in one frame.
Simplicity! The 3-phase squirrel cage motor has no starting brushes, commutator or other such wearing parts.
Self-lubricated motor and pump are totally oil-immersed.
High-pressure testing eliminates possibility of oil leaks.
Self-contained and self-supporting! No foundations, nor piping, nor connections needed!

THIS NEW SYSTEM IS SPECIFICALLY DESIGNED FOR FORCED-OIL COOLING OF POWER TRANSFORMERS!

ALLIS-CHALMERS

IN FORCED OIL COOLING— JUMPS CAPACITIES OF MOST TRANSFORMERS 20-60%!

Now you can handle increased load without adding any new power transformers!

TODAY almost all U. S. power transformers depend for cooling on slow thermo-syphon flow of insulating oil through their radiators.

By accelerating that flow with pump action — and by forcing cooling air over radiator surfaces — the capacity of those transformers can be sharply increased.

That's exactly the job Allis-Chalmers' new ELECTRO-COOLER was designed to do!

On most transformers, the new ELECTRO-COOLER can step up capacity 20 to 60%. Welcome news in wartime!

Simple to Install

New foundations are not required . . . there's no need to shift transformers. ELECTRO-COOLERS are self-supporting.

Because the ELECTRO-COOLER is factory-assembled as a unit, there are no pipe connections or joints to be made in the field.

Maintenance? It's at a *minimum!* To reduce possibility of oil leaks or seepage, every ELECTRO-COOLER is factory-tested at 50 pounds pressure. (Maximum *working* pressure is only a few pounds!)

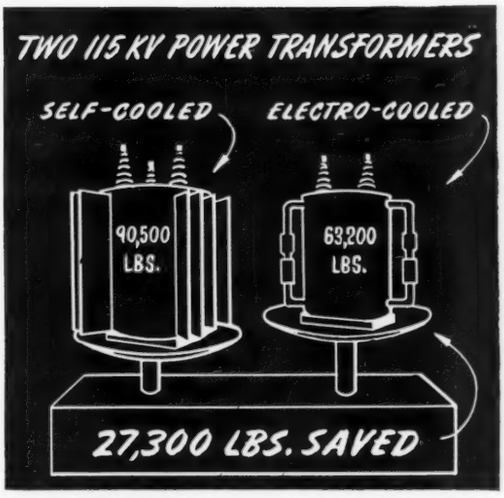
And there are no stuffing boxes to require packing. Motor and pump are built on one shaft and in one frame for greater strength. They're *self*-lubricated!

Big Metal Savings

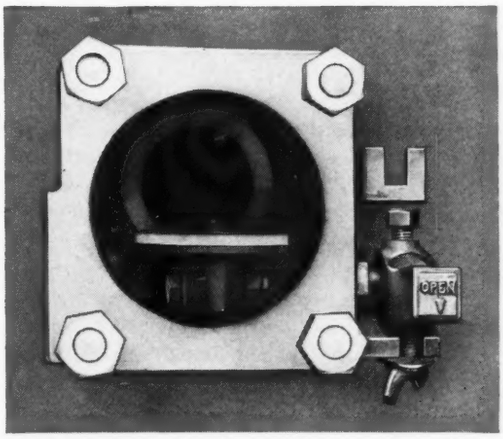
Applied to new transformers, the new ELECTRO-COOLER reduces copper and steel needed by about 25%. Added to existing transformers, it saves up to four times its own weight in scrapped radiator steel for other vital uses!

Here's a wartime investment with a great peacetime future! To learn what the new ELECTRO-COOLER can do for *your* system, call the district office near you. And write for Bulletin B6242. ALLIS-CHALMERS MFG. CO., MILWAUKEE, WIS.

A 1566



Savings like these in copper and steel — an average of 25% — can be made on every contemplated power transformer installation.



No need to drain oil if transformer has this standard radiator valve.

TRANSFORMERS

ALLIS-CHALMERS MILWAUKEE AC WE WORK FOR VICTORY WE PLAN FOR PEACE

THAT THERE SHALL ALWAYS BE LIGHT

On the production front all over the country men are hard at work making guns, planes, ships, and tanks. Tools for Victory. And Federalite NTPR panelboards are hard at work, too, giving perfect control and protection of lighting and small power circuits.

Panelboards alone, like any single factor taken by itself, won't win the war. But anything that helps speed up output and improve quality—anything that helps get the job done better and faster–*helps* win the war. That's just what Federalite NTPR panelboards are doing. These rugged, precision-made Federalite NTPR panelboards are built for service. Steady and dependable, they offer many advantages—switch ahead of every fuse gives higher safety factor . . . floating contacts . . . frictionless snap-action mechanism . . . solderless lugs in mains and branches . . . giant, easy-grip switch handles . . . shallow depth for mounting in thin walls . . . large wiring gutters . . . *low cost.* These are but a few of the reasons why Federalite NTPR panelboards are being installed in greater number today than ever before.

To assure a steady flow of power for lighting and small power circuits . . . to protect the lights by which men work . . . to help keep the wheels of industry rolling . . . that's the job these low cost panelboards do. *For complete information write for catalog 42.*

Federal

FEDERAL ELECTRIC PRODUCTS COMPANY

64 Paris St., Newark, N. J.

SAFETY SWITCHES • SWITCHBOARDS
PANELBOARDS • CIRCUIT BREAKERS

SAN FRANCISCO 1264 Folsom St.
LOS ANGELES 440 Seaton St.
PORTLAND, ORE. 121 N.W. Fifth Ave.

BOOKS *you may want*

FREQUENCY MODULATION, by August Hund, (first edition), 375 pages, illustrated—113 figures, appendix, McGraw-Hill Book Co., $4. The problem of modulation control is particularly important in high frequency current studies pertaining to the radio art. The theory of distorting or modulating such current by amplitude changes, frequency changes, and phase changes is given a thorough mathematical treatment in Chapter I. It is particularly suited for the individual requiring sound basic knowledge on this subject. Frequency modulation is now of great value to the radio and allied industries. A good mathematical background is necessary to obtain the maximum benefit from this book.

Chapter II describes the apparatus required to produce the desired modulation system both from a theoretical standpoint and a practical one, including the equipment and auxiliary apparatus required.

The final chapters treat the subjects of transmitters, receivers, transmitter and receiver aerials. Commercial apparatus and equipment are discussed together with an adequate description of the entire subject.

The book contains many illustrations and graphs. The appendix supplies valuable information in the form of tables and equations. An exceptionally complete bibliography is included which covers the entire field of high frequency modulation, and is a valuable reference to those working with this subject. —F.S.B.

BIBLIOGRAPHY ON AUTOMATIC STATIONS, 1930-1941, American Institute of Electrical Engineers, 33 West 39th St., N. Y., 25c (members) 50c (non-members) quantity discount. Sponsored by the AIEE committee on automatic stations, this publication supplements earlier bibliographies on the subject published in AIEE transactions.

Entries are numbered consecutively by sections and listed alphabetically by years. Material is divided into sections as follows: general, supervisory and remote control; telemeter and telemetry; automatic and remote controlled switches and switchgear; automatic features of generating stations using fuels: automatic boiler and combusion control; automatic hydroelectric plants; automatic substations.

BOILERS AND COMBUSTION, 1941, Edison Electric Institute, $1.20 (members and their employees), $3 (non-members in USA), $3.15 (foreign). This is a report of the boilers and combustion subcommittee of the prime movers committee. It contains statements by the subcommittee, operating companies and manufacturers on boiler-pressure parts; combustion control and supervision; high-temperature superheater performance; external and internal boiler cleaning; oil and gas fuels: stokers.

NEMA HIGH VOLTAGE INSULATOR STANDARDS, National Electrical Manufacturers Assn., 155 E. 44th St., N.Y., $1. Tables of characteristics for standard insulators shown in this publication are the outcome of study and research by member companies of the NEMA high voltage insulator section, and make available complete interchangeability of standard insulators manufactured by the principal American manufacturers.

WHAT DO YOU REALLY KNOW ABOUT AN AVERAGE SUSPENSION INSULATOR?

Out of 1000 suspension insulators whose average strength is, say 15,000 pounds, you pick up one. What do you really know about it? Maybe it's exceptionally strong. Maybe it's about properly rated. Maybe its strength is below par. There must be all three kinds to make up an *average*... Remember that while suspension insulators hang in bunches, they break one at a time. The weakest unit establishes the strength of a string... Based on this simple logic, O-B rates suspension insulators by *minimum strength*. Naturally there are strength variations, but they are all *above* a definite value. You know where you stand when you specify O-B insulators. They have the kind of strength that counts, because you can really count on it--O-B minimum strength ratings.

Ohio Brass

2343-H

MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ontario

The "64 Dollar Questions"

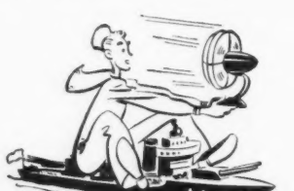
Answered Here!

"INFORMATION PLEASE" General Electric Consumers Institute answers hundreds of questions about rationing and restrictions, shortages and substitutes. All those problems puzzling America's wartime homemakers are being carefully studied and sensibly solved in the Institute's experimental kitchens, laundries, and research laboratories. And the answers make up a very useful library of booklets and bulletins for your customers. They're doing a swell job of building goodwill now for good business after Victory.

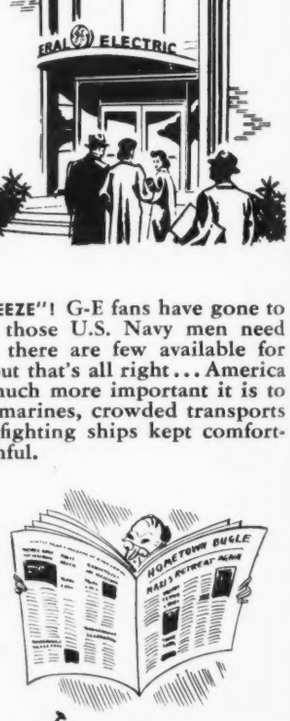
What Do You Read?

Look in your favorite magazines for the new G-E ads. You'll like 'em! Here's the schedule for the month of February:

MAGAZINE	DATE ON NEWSSTAND	ISSUE DATE
Post	Feb. 24	Feb. 27
Life	Feb. 26	Mar. 1
Collier's	Feb. 26	Mar. 6
Look	Feb. 9	Feb. 23
American Home	Feb. 25	March
House Beautiful	Feb. 20	March
Woman's Home Cp.	Feb. 20	March
Holland's Magazine	Feb. 15	March
Country Gentleman	Feb. 24	March



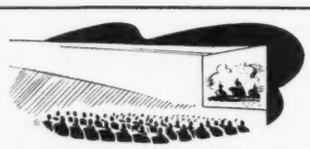
"SPANKING BREEZE"! G-E fans have gone to sea and how those U.S. Navy men need them. In fact there are few available for civilian use. But that's all right... America knows how much more important it is to have U.S. submarines, crowded transports and compact fighting ships kept comfortable and healthful.



SMALL TOWN SPECIAL! From Schenectady a series of G-E Institutional ads goes out to over 1400 local "country" newspapers. This is in addition to the many G-E ads appearing in the leading national magazines like Life, Collier's, Sat. Eve. Post, McCall's, etc. All this helpful advertising creates tremendous goodwill for every G-E retailer.

G-E World Tours Dept.

Wherever American boys are fighting you'll probably find a General Electric Refrigerator somewhere behind the lines where the sick and hurt are cared for. G-E Refrigerators—on the war front—are helping save soldiers' lives by keeping blood banks and precious serums safe and ready for use.



NOW SHOWING! Colossal! Stupendous! Breath-taking!!!
Well anyway, these G-E Service Training Films are pretty darn good. The one titled "Into the Wringer and Out" shows dealers how and why to go after service and repair business. If you would like to see it, get in touch with your G-E Appliance Distributor and he'll arrange a personal showing.

SCRAP IS POWER
YOU HELP
...The War Effort...Your Customers and Yourself
When you salvage, in accordance with your manufacturer's instructions, all inoperative parts containing
CRITICAL MATERIALS
Cooperate with your industry! Put vitally needed scrap back into the scrap TODAY!

WAR BONDS WILL BUILD AND EQUIP NEW VICTORY HOMES TOMORROW!

GENERAL ELECTRIC

NEW "Rub-Less" WIRE

NO RUBBER, NO SYNTHETIC, NO TIN

1 Transversely crumpled, moisture-resistant Kraft 2 Cellulose-acetate butyrate (Kodapak No. 2) insulation 3 No tin or alloy coated copper 4 "Dilec" cotton serving 5 Moisture-resistant, flame-retardant finish

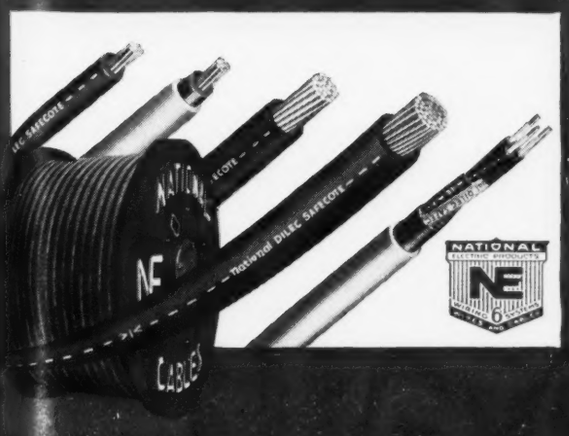
Made in all sizes, 14 to 1,000,000 CM, and in standard colors —black, white, red, blue, green and yellow.

Lead covered "Rub-r-Less" Wire, Type "EIL" with standard wall thickness of lead, also CAA specification, lead covered, with 2 "Dilec" servings over the lead for underground work.

Approved by the Underwriters' Laboratories Inc. for use as a substitute for rubber insulated wire under conditions stated in Interim Amend. Nos. 44 and 69 covering Section 3005 of the N. E. Code.

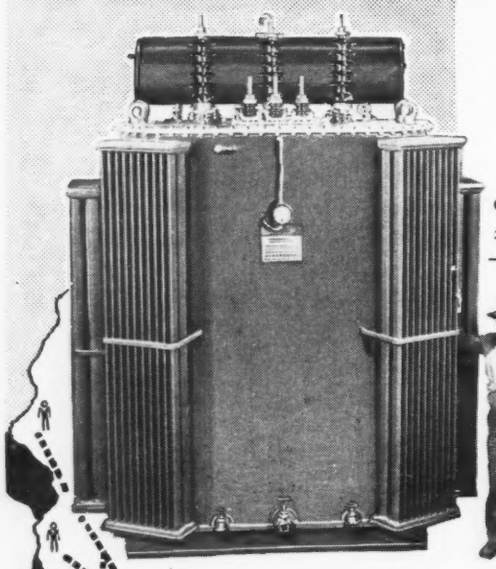
Conforms to Department of Commerce CAA-612 Specification also Section 34 War Department Office of Chief Engineers Specification for Theater of Operations and Mobilization Construction. "Rub-r-Less" Wire is also included in suggested specifications to architects issued by Federal Works Agency, Public Building Administration.

Distributed through National Electric distributors throughout the United States.



National Electric
PRODUCTS CORPORATION
Pittsburgh, Pennsylvania

for 1943 Uptegraff TRANSFORMERS



Minneapolis, Minn.
H. R. Harris Company
708 Sixth Ave., South

Detroit, Mich.
F. E. Shoff
15486 Ardmore Ave.

Buffalo, N. Y.
John E. Hoffman
92 Trinity Place

Chicago, Ill.
H. L. Brueck
53 W. Jackson Blvd.

Cleveland, Ohio
Ambos-Jones Co.
1085 The Arcade

Boston, Mass.
J. J. Costello Co.
131 Clarendon Street

Cedar Rapids, Iowa
Fred Farrell
3741 Centre Point Rd.

New York, N. Y.
Hernandez Elec. Int'l. Co.
30 Church Street

Philadelphia, Pa.
H. F. Darby, Jr.
2019 Rittenhouse Sq.

Scottdale, Pa.
Home Office and Plant

Pittsburgh, Pa.
J. A. Malady Company
903 Oliver Building

Atlanta, Ga.
Walter V. Gearhart Co.
Volunteer Bldg.

Indianapolis, Ind.
Henry J. Damm
305 Merch. Bank Bld.

St. Louis, Mo.
D. O. Stewart
Fourth and Olive Sts.

Export Representative
Hernandez Elec. International Co.
30 Church Street, New York, N. Y.

Denver, Co'o.
Alex. Hibbard Co.
1863 Wazee Street

Dallas, Texas
E. H. Jacobs Company
P. O. Box 113

Kansas City, Mo.
J. G. Pickett Company
Dwight Bldg.

New Orleans, La.
Frank P. Fischer
1820 Audubon St.

Honolulu, T. H.
H. R. Slocum Co.
814 Katiolani Blvd.

Seattle, Wash.
Burton R. Stare
802 33rd Avenue

San Francisco, Cal.
Oliver B. Lyman
74 New Montgomery St.

Los Angeles, Cal.
The Demmert Co.
106 W. Third Street

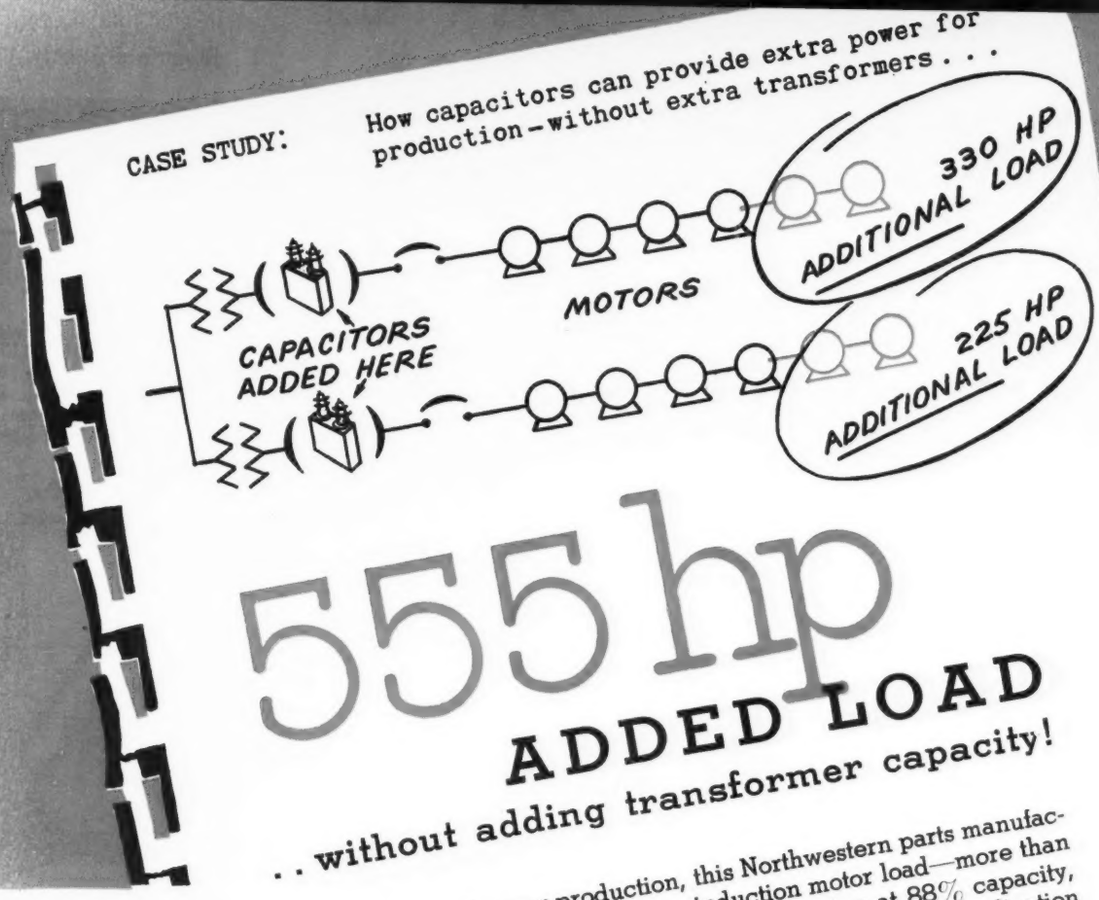
An Uptegraff designed and built Transformer is assurance of Satisfaction

There is a quality and a sureness in Uptegraff Transformers that is meeting the needs of our Allies of the United Nations, and serving in scores of industries here in this Country.

Designing and building Transformers only, you find in Uptegraff quality and service that is unsurpassed.

Tell us your Transformer requirements.

R. E. UPTEGRAFF Manufacturing CO.
SCOTTDALE, PENNA., U.S.A.


CASE STUDY:
How capacitors can provide extra power for production—without extra transformers . . .
330 HP ADDITIONAL LOAD
MOTORS
CAPACITORS ADDED HERE
225 HP ADDITIONAL LOAD

555 hp ADDED LOAD

. . without adding transformer capacity!

In expanding for war production, this Northwestern parts manufacturer had to add a 555-horsepower induction motor load—more than his existing distribution system, already operating at 88% capacity, could possibly handle. An analysis, however, revealed that application of capacitors would permit the additional load and eliminate need for added *transformer, switchgear, or wiring capacity*. Furthermore:

1. Capacitors could be installed in a fraction of the time otherwise necessary to expand the plant distribution system capacity—thus saving vital war production time.
2. Capacitors would require less critical material.
3. Capacitors would save $200 on the monthly power bill because of the improved power factor—thus repaying their cost within 18 months.

HOW IT WAS DONE:

The plant distribution system comprised two transformer banks, one of 300 kv-a and one 600 kv-a—both operating near capacity with motor loads of 240 kv-a and 550 kv-a respectively. The 240 kv-a load averaged 156 kw at 65% power factor, while the 550 kv-a load averaged 385 kw at 70% power factor.

Application of capacitors increased the power factor to 97% on *both* banks, making available a total of 140 kv-a more on the 300 kv-a bank and a total of 200 kv-a more on the 600 kv-a bank. This made it possible to add a 225-hp motor load on the smaller bank, and a 330-hp load on the larger bank (both at 60% load factor) without any increase in transformer capacity.

J-60514-A

CAN *YOU* USE this method of obtaining more power from your transformers? You can find out, quickly, from your Westinghouse representative.

EVERYBODY BENEFITS from application of capacitors. Users gain both in reduction of power costs and in higher load capacity per kv-a of transformer capacity. Power companies gain additional pay load. The national war effort gains through conservation of power, quick expansion of production facilities and reduced requirements for transformer substations.

REMEMBER, too, that improvement in power factor improves plant voltage conditions. In the case study reviewed on this page, removal of 100 "useless" amperes from feeder circuits greatly improved voltage regulation and motor starting.

A SUGGESTION: If you are planning to increase your motor load—or if you have motor starting trouble or dimming of plant illumination—ask your Westinghouse representative for a capacitor analysis. Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

WESTINGHOUSE

Westinghouse
CAPACITORS

RE-LIGHTING

the new manpower / production *requirement*

Vital to plants built and lighted for daylight operation

Most plants operating today were designed and built for peacetime, *daylight* working schedules. Wartime production demands night work. *Lighting based on daylight conditions is inadequate to serve the needs of night workers.*

Night production is generally acknowledged to be anywhere from 20% to 40% less efficient than daytime production. And poor lighting, with its consequent eyestrain, fatigue, and lower working efficiency, is a major cause of this slump.

Re-lighting for 24-hour-a-day war production is the easiest, most economical remedy for this condition. Re-lighting does not mean discarding your present lighting system. It merely means bringing the equipment you have up to date by relocating lamps to eliminate glare and shadow; increasing lamp wattages, re-spacing lamps, installing additional equipment to insure uniform lighting levels throughout your plant. A Silv-A-King lighting engineer can tell you exactly.

Silv-A-King has specialized on industrial lighting for 21 years. Silv-A-King quality equipment (fluorescent or incandescent) plus a Silv-A-King "engineered layout" makes an unbeatable combination.

BRIGHT LIGHT REFLECTOR COMPANY, INC.
312 Morgan Avenue, Brooklyn, N. Y.

Send for your copy of our 16-page book: "Light Is An Essential Production Tool"

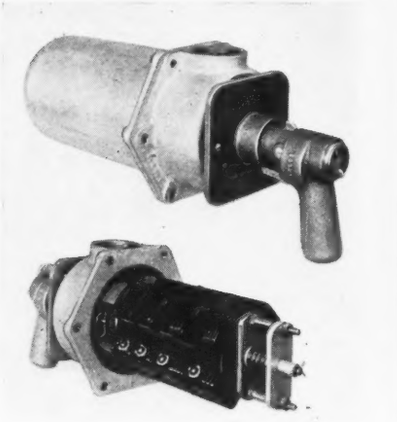
SILV-A-KING

SILV-A-KING MAKES *Light* WORK FOR YOU

PRODUCTS
that are news

Control Switch (200)

An immersion proof control switch has been announced by Delta-Star Electric Co. This heavy duty switch is rated at 20 amp., 600 volt a-c with four circuit control. Turning handle to right or left closes a circuit; pushing in handle opens third circuit and pulling



out handle opens fourth. A spring return restores to normal conditions by releasing handle after operation. Locking features in the handle design permit locking in either the normal or pushed in position.

Variable Resistors (201)

Two closed-cover sealed variable resistors have been developed by the Stackpole Carbon Co. and are claimed to perform faithfully under humid or dusty conditions and in either standard radio or high frequency equipment.

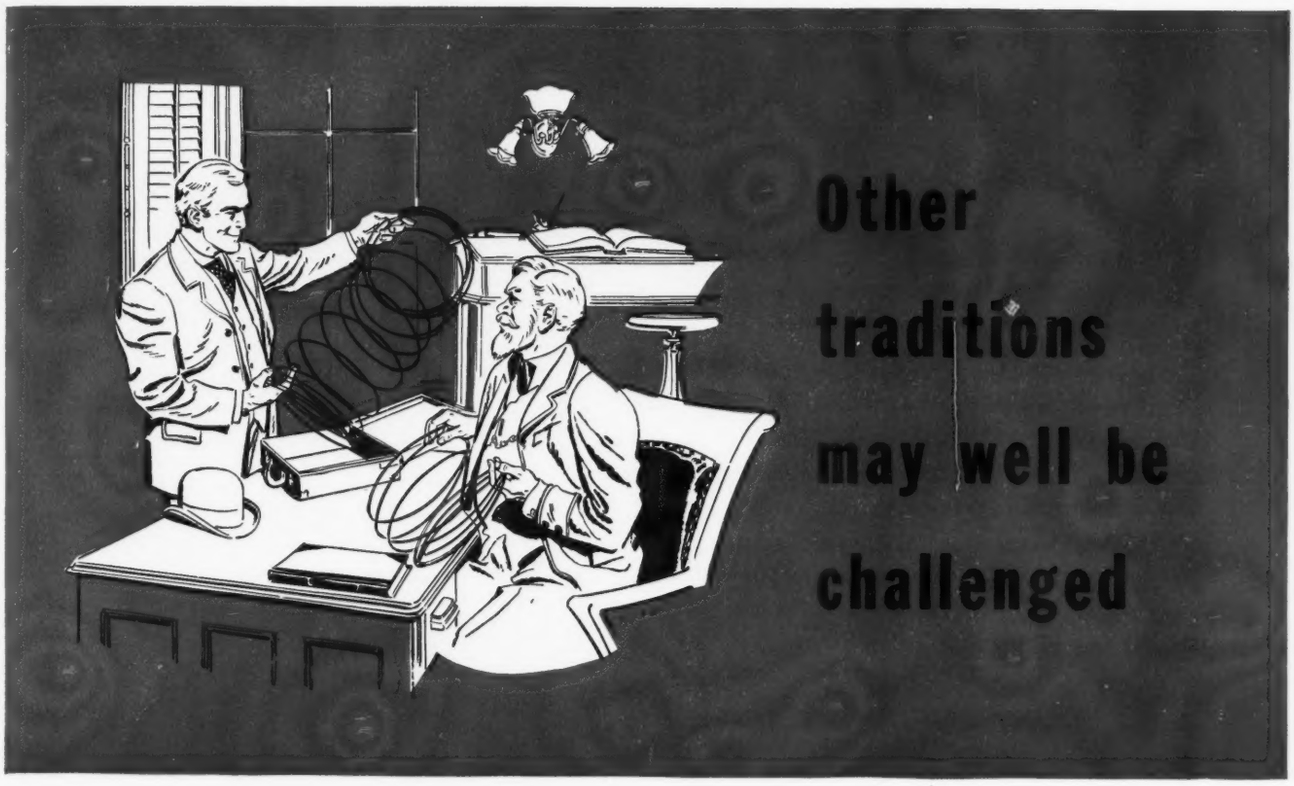
The Type MG resistor is said to have a leakage resistance on the order of 300 megohm after 48 hours in 95% humidity at 40° C. The Type LP resistor is now furnished with a dust-proof cover and is sealed with a special compound to the point where resistivity from current-carrying parts after 48 hours of 95% humidity at 40° C. is five times that of the previous open construction units, according to the manufacturer.

Non-Critical Wire Covering (202)

An electric wire covered with non-critical material has been announced by National Electric Products Corp. for wartime building. Following research for a wire covering which would conform to all requirements of fire and moisture resistance, the company states that it has developed a new insulating material together with a specially treated paper, which seem to do the job as well as any tin and rubber combination.

Solder Iron Stand (203)

Photobell Corp. has designed an electric solder iron stand which features shadowless lighting under a hood; 30 in. chimney to remove fumes; 5 in. diameter magnifier; and rubber bumpers to protect the hands. A background card holder accessory provides a uniformly white background for the work and can be used to hold a diagram of connections.



Alcoa departed from tradition when they first introduced Aluminum as a conductor material to the electrical industry. Imagineering at work, forty-odd years ago, visualized a new, high conductivity, lightweight, corrosion-resistant conductor material. Then they engineered it into reality; first all-Aluminum, then A.C.S.R.

A million miles of Aluminum Cable Steel Reinforced, in service on hi-lines and rural lines all over America, long ago proved the sound thinking of those early Imagineers. Aluminum bus conductors, in the form of flat bars, tubing and channels, have also proved their worth in central stations, substations and industrial plant distribution systems.

Today, new concepts of Aluminum arise from the swift technological advances resulting from the war effort and the greatly increased Aluminum production. New joining methods, new fabricating procedures, new alloys, new commercial forms, all combine to provide new economies and to broaden post-war applications of Aluminum.

Many of these new applications will be electrical. Versatile Aluminum will become an even more important tool in the hands of the electrical engineer. We'll gladly discuss the economic aspects of Aluminum with you as they apply to your design problems. ALUMINUM COMPANY OF AMERICA, 2132 Gulf Building, Pittsburgh, Pennsylvania.

Dear Bill:

I just couldn't sit home any longer—waiting for your letters, worrying, but doing so little to bring you home sooner.

You see I started in this week at the war plant. They're training me to be a drill press operator. And you can just wipe that grin off your face, you big goof. The foreman says I'll make a darn good one!

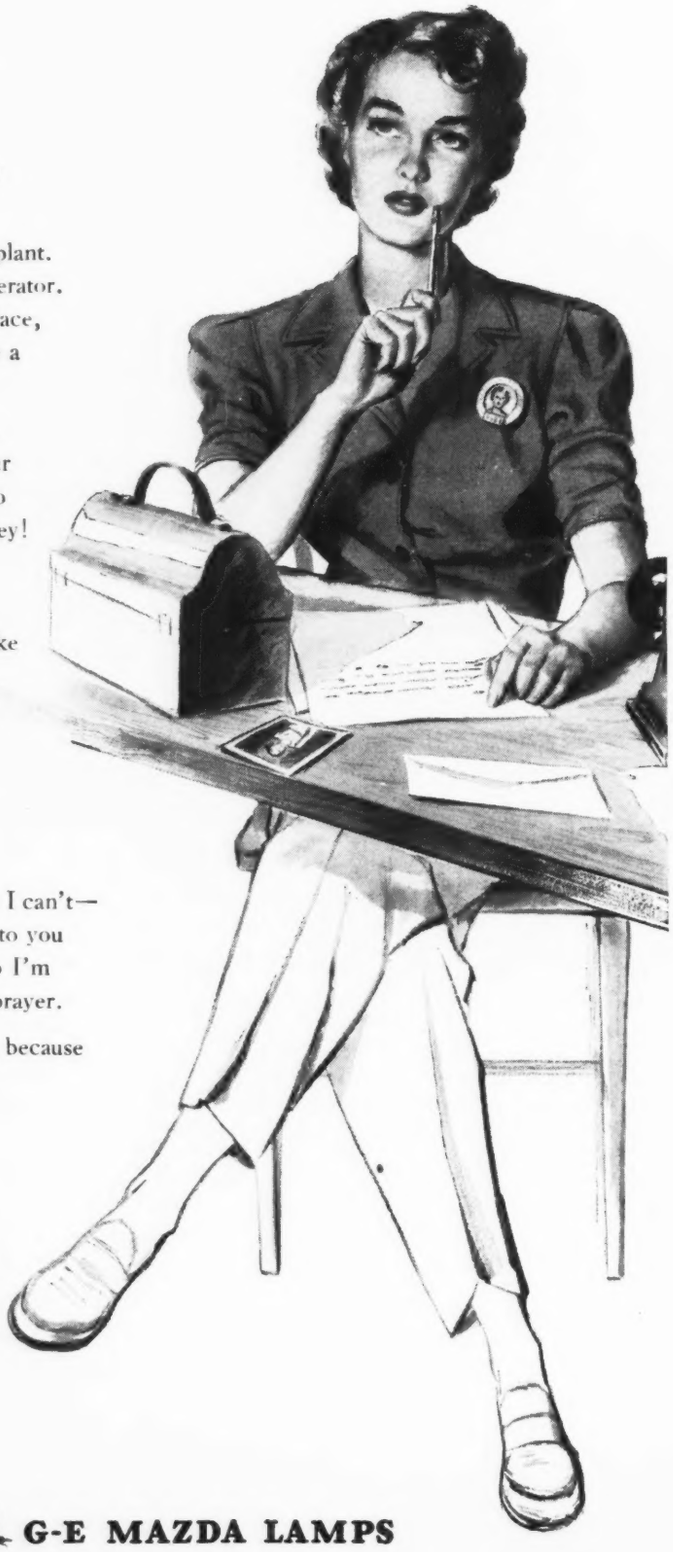
So here's a picture of me in my uniform. Remember how you used to wipe the flour smudges off my nose? Well, you ought to see me now—I'm a regular grease monkey!

I admit I was pretty scared the first day, until I got up nerve to really look the place over. I was afraid it would be like working in a dungeon—all dark and dingy!

But it's not like that at all. Why, the plant's as bright and cheery as our own kitchen. Even has that new fluorescent lighting!

I wish I could tell you what we're making. I can't—but I hope one of them may find its way to you someday—just when you need it most. So I'm sending my love with every one—and a prayer.

I'm not counting the minutes any longer, because I know you'll be back pretty soon.
So, darling . . . . . .
Oh, oh. There's the whistle now!

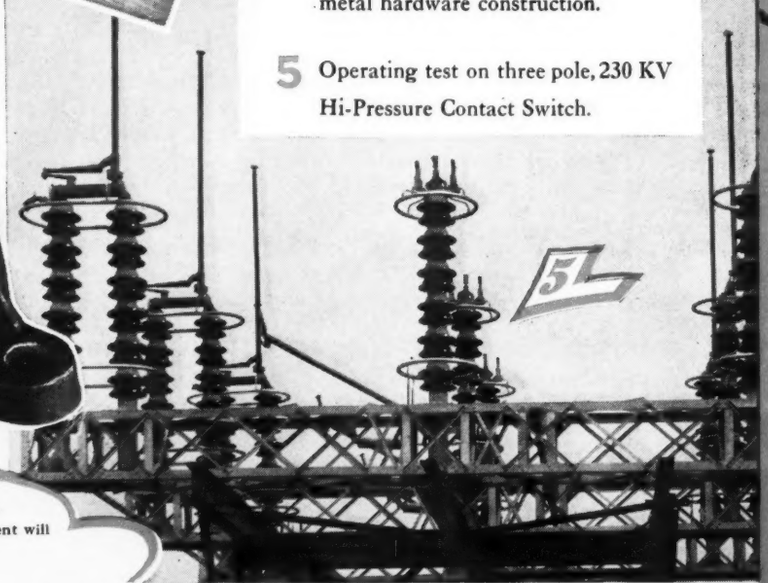


The lighting industry's biggest job today is to keep lighting at top efficiency twenty-four hours a day in the nation's war plants... G-E lighting engineers are ready to work with you to give war factories the better light they need for better production.

G-E MAZDA LAMPS

GENERAL ELECTRIC

CHECK THE FACTS on R&IE Products



MECHANICAL TESTING shows the Margin of Quality in equipment. R&IE materials and processes are used only after qualifying under thorough, punishing tests. Tests prove, far beyond actual service conditions, their fitness for finished assembly.

1. An exaggerated bending and twisting test checks materials used in R&IE switch parts.
   Note - No evidence of cracking.
2. Tension test checks strength of R&IE assembly methods. Stressed to 23,400 lbs., joint remained perfect while holes and metal elongated.
3. Actual operating tests check the proper application of flexible connector to outdoor switch - 8571 operations without injury.
4. Cantilever break test on Class B Indoor insulator checks R&IE die-metal hardware construction.
5. Operating test on three pole, 230 KV Hi-Pressure Contact Switch.

ENGINEERING AND PRODUCTION
●
COMPLETE SUBSTATION
●
OPERATING MECHANISMS
●
DISCONNECTING SWITCHES
●
AIR BREAK SWITCH
●
CONNECTORS
●
BUS CLAMPS
●
CUTOUTS
●
THERMO-RUPTERS
●
METAL HOUSED, ISOLATED BUS
●
TESTING FACILITI
●
AUTOMATIC THROW-OVER EQUIPMENT
●
METAL CUBICLES
●
INTERLOCKS
●
TESTING DEVICES

We **"CHECK THE FACTS"** *for you.*
You can see today how R&IE equipment will serve well tomorrow.

RAILWAY AND INDUSTRIAL ENGINEERING CO., GREENSBURG, PA.
IN TORONTO, CANADA EASTERN POWER DEVICES, Ltd.

New! Crapo STEEL CONDUCTOR MANUAL

ENGINEERING DATA & CONSTRUCTION PRACTICES
Crapo
HIGH TENSILE • LOW RESISTANCE
Steel Conductors
INDIANA STEEL & WIRE COMPANY • MUNCIE, INDIANA

Write for your copy today!

● A new and comprehensive manual, filled with engineering data and up-to-the-minute information about *Crapo* Steel Conductors, is just off the press.

● Its contents include electrical characteristics and performances of this high-tensile, low-resistance ferrous conductor, sag and tension tables and charts based on the new Fifth Edition of the National Electric Safety Code, recommended construction practices, results of outdoor vibration and fatigue tests never before published, and other valuable and timely information.

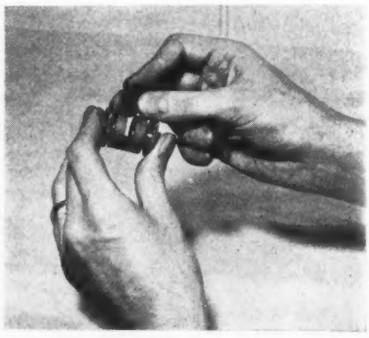
●Transmission and Distribution Engineers will find within its pages the solution to many of their present perplexing conductor problems. Write today for your copy of this new *Crapo* Steel Conductor Manual!

INDIANA STEEL & WIRE COMPANY • • MUNCIE, INDIANA
Graybar Electric Company, Inc., Distributors

Crapo HTC-130 STEEL CONDUCTORS

Circuit Testing Device (209)

A circuit testing device for Novalux loop-sectionalizing cutouts equipped with a Thyrite by-pass has been announced by General Electric Co. The testing by-pass is equipped with an SL-type film cutout. This device enables the serviceman to determine whether the circuit is actually closed before installing



a new Thyrite by-pass, the manufacturer states. If an open circuit causes the cutout to trip out, the circuit is repaired and the testing by-pass is inserted before the Thyrite by-pass is put into place.

Battery-Cutout Relay (210)

An automatic battery-cutout relay has been announced by General Electric Co. for use in ship service and wherever batteries are charged from generators.

This relay, according to the manufacturer, performs practically the same function as the circuit cutout device in an automobile. When the battery voltage is lower than the voltage of the starting source, the relay closes the charging circuit. When the charging voltage drops to a value below the battery voltage, the cutout relay opens the circuit on a small reverse current.

Continuous current ratings available are 2.5, 4, 6.5, 10, 16, 25, 40, 65 and 100 amp. Voltage ratings are 7.5 volts (3-cell batteries) to 300 volts (120-cell batteries). The relay is set to pick up at slightly below the normal charging voltage.

Electric Brazer (211)

A new electric brazer for brazing and soldering with silver solder has been put on the market by the Ideal Commutator Dresser Co. Uses listed by the manufacturer include making electrical connections in motors and transformers; soldering lugs, terminals and bus bars; repairing band saws, etc. Makes butt, lap, scarf, cable or spud joints. Power supply, 230 volt, 50-60 cycle, single phase; rating 7½ kva.

Spray Gun (212)

A spray gun with plastic body has been manufactured by the Eclipse Air Brush Co. This gun is said to weigh a quarter of a pound less than the unit with aluminum body that it replaces. According to the manufacturer, the plastic is strong, has good chemical resistance and is not affected by thinners, solvents or paint removers.

Aircraft Relay (213)

A solenoid type 25-amp. aircraft relay has been developed by the Hart Mfg. Co. This unit features a rigid cap which protects the relay from dust and reduces the danger of mechanical damage, the announcement states.

ONE ANSWER

TO 3 QUESTIONS ABOUT TRANSFORMERS

1. How can heavier loads be handled?
2. How can this equipment be protected against loss?
3. How can service interruptions be reduced?

LOADING BY COPPER TEMPERATURE (L.C.T.) WITH CSP TRANSFORMERS

The answer to these questions is based on this fact: **Loading by Copper Temperature (L.C.T.) increases usable transformer kv-a by 25% to 40% —with complete safety!**

1 L.C.T. puts the reserve thermal capacity of a transformer to work. Emergency overloads can be carried longer, without danger, right up to the thermal limit of the windings.

2 L.C.T. gives sure protection against burnouts—positively disconnects a dangerous overload before windings can be damaged.

3 L.C.T. provides a visible indication of dangerous overload conditions so that load can be arranged, if necessary, to avoid power "blackouts."

Ask your Westinghouse engineer to give you the facts about this transformer development. He'll be glad to submit definite recommendations . . . glad to help you get more out of your transformer applications. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N. J-70398

TRIPLE ACTION

FOR PROTECTING TRANSFORMERS

MEASURES the amount of overload. Loading by Copper Temperature uses *actual* winding temperature, takes into consideration load duration and magnitude.

SIGNALS approach of thermal capacity. Unnecessary interruptions of service are avoided because a red warning light flashes when dangerous winding temperature is being approached.

DISCONNECTS load from transformer. If overload actually becomes dangerous, an internal circuit breaker *automatically* removes the load from the transformer.

Westinghouse

PLANTS IN 25 CITIES ... OFFICES EVERYWHERE

CSP TRANSFORMERS

Doing the same fundamental Job in 1943 but so much more of it!

ARMY E NAVY

Most manufacturers engaged in war production are working on products foreign to their normal efforts. But it's a different story here at WESTON. We have exactly the same job to do because our job is *so fundamental;* but there's much more, *so much more of it.* For precise measurement is vital to the efficient functioning of equipment in *all* branches of a highly mechanized war machine. And while measurement fundamentals have not changed, the universal preference for instruments the way WESTON builds them *has not changed either.*

So WESTON'S job, as we enter the New Year, still remains the job of striving to keep abreast of the country's unprecedented and critical instrument needs. Production has been increased many fold through expanded and scattered manufacturing facilities. And the curve *continues* upward. But never to the point where we must relinquish, *one bit,* our quality standards — 'else some pilot's safety might be *less* secure . . . a ship's reckoning *less* accurate . . . a critical power plant *less* efficient.

But achieve the production goal *we will;* without jeopardizing quality . . . without interrupting our continuing development program now focused on instruments to help speed victory. And in accomplishing this goal, we will have equipped ourselves to serve *even better* the new and increased instrument needs of the future . . . the needs of American industry at peace. Weston Electrical Instrument Corporation, 577 Frelinghuysen Avenue, Newark, New Jersey.

Laboratory Standards . . . Precision DC and AC Portables . . . Instrument Transformers . . . Sensitive Relays . . . DC, AC, and Thermo Switchboard and Panel Instruments.

WESTON

Specialized Test Equipment . . . Light Measurement and Control Devices . . . Exposure Meters . . . Aircraft Instruments . . . Electric Tachometers . . . Dial Thermometers.

FOR OVER 54 YEARS LEADERS IN ELECTRICAL MEASURING INSTRUMENTS

WESTERN REPRESENTATIVES

Seattle, Wash.
Eicher & Bratt
263 Colman Bldg.

San Francisco, Calif.
Herman E. Held
420 Market St.

Los Angeles, Calif.
Edward S. Sievers
417 So. Hill St.

Denver, Colo.
Howard Peterson
1921 Blake St.

Phoenix, Ariz.
J. E. Redmond Co.
448 W. Madison St.

For War Job Wiring Supplies

SEE THE G-E WIRING MATERIALS DISTRIBUTOR IN YOUR NEIGHBORHOOD

F. A. Block (left), supply sales manager, General Electric Supply Corporation, Seattle, Wash., is advising Marion Harrell, salesman, same distributor, how best to handle a wiring material order quickly for one of the local shipyards.

The G-E Wiring Materials Distributor near you is a close source of supply for maintenance wiring materials necessary to the war effort. This distributor also handles the conduits, boxes and fittings, wires and cables and wiring devices needed for war project wiring conversion and for new war wiring.

You'll like the friendly service given by your G-E Wiring Materials Distributor. This service extends beyond just supplying the materials you ask for. Talk with a representative about your wiring problems. He'll be able to make helpful suggestions . . . to help plan wiring . . . to assist in the selection of materials . . . to discuss new developments.

Your G-E Wiring Materials Distributor handles high quality, uniform wiring materials and can provide materials suitable for your needs. Use these materials and the services offered to help speed the war jobs you are handling.

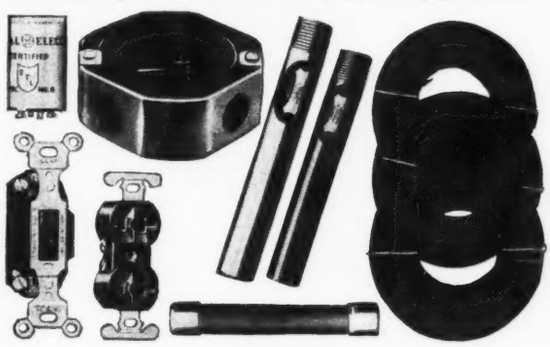
G. A. Boring (right), manager, General Electric Supply Corporation house, Portland, Ore., and Ben Huenergardt, electrical contractor, Portland, are here discussing R. C. wire and BraidX required for an important rush job Mr. Huenergardt is handling.

G-E district representatives in all parts of the country help distributors serve customers. This is J. J. Burns, who is a member of the West Coast field force.

Sales meetings are held at the Salt Lake City, Utah, General Electric Supply Corporation house as they are at other G-E distributors' houses to determine ways of best aiding customers. In photograph, men leaving meeting are left to right: Top row, W. O. Smith, sales manager; William Walker, service department; W. B. Roberts, salesman — Lower row, J. E. Bolton, salesman; J. L. Fahey, operating manager.

G-E WIRING MATERIALS

See the G-E Wiring Materials Distributor near you about conduit, boxes and fittings, wire and cable and wiring devices for your special requirements. Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.



GENERAL ELECTRIC

ELECTRICAL

Essentials

FOR

PRODUCTION!
MAINTENANCE!

Essex Wire Products
Magnet Wire, Lead Cables, Aircraft Wire, Rubber Cords

Ohio Carbon Products
Motor and Generator Brushes, Radio Suppressors and Resistors

Homer Commutators
Motor and Starter Commutators, AC & DC Commutator Replacements

Taylor Fibre
Phenol Fibre Sheet, Rod, Tube; Vulcanized Fibre Sheet and Parts

Vartex Insulation
Cambric Cloth and Tape, Saturated Sleeving, Mica sheet

Pedigree Varnishes
Insulating Varnishes, Sealers and Compounds

Bunting Bronze Bearings
Motor and Generator Bearings, Bronze Bars and Sleeves

Dielectric Tapes
Friction and Rubber Tapes, Cotton Tape and Sleeving

Complete Catalog Information

Factory Representatives

TRI-STATE SUPPLY CORPORATION

544 S. SAN PEDRO STREET
LOS ANGELES MUtual 2354

554 BRYANT STREET
SAN FRANCISCO EXbrook 8890

Also Ask Your Electrical Wholesaler

for

Crescent Insulated Wire and Cable

and

Steelduct Conduit and Electric Metallic Tubing

Automatic Transfer Switch (204)

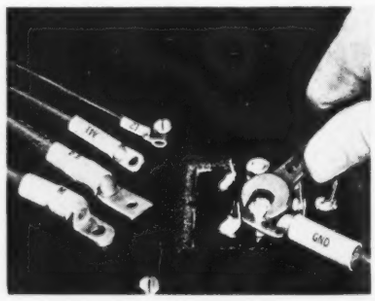
An improved automatic transfer switch is being manufactured by Zenith Electric Co. and is claimed by the manufacturer to transfer load from normal to emergency service without interruption or lag. According to the manufacturer, it is so designed that all contacts are carried on one shaft and operate in the same direction. Contacts are either in the normal or emergency position; no "off" position is possible.

One magnet frame with the coil connected to the normal supply line holds the normal contacts closed and the emergency contacts open during normal operation. On failure of the normal service the normal contacts open by gravity and the emergency contacts close by means of individual compression springs on each contact. On resumption of normal service, the magnet closes the normal contacts and opens the other source of supply. The switch can be set for timed automatic supply when desired.

Units are made to operate from a-c to a-c; a-c to d-c or in any combination. The new switch is furnished in 1, 2, 3 and 4-pole types and 18 capacities from 30 to 600 amp.

Insulator and Wire Marker (205)

Irvington Varnish & Insulator Co. is manufacturing a combination insulator and wire marker made of short lengths of extruded plastic tubing marked with letters and numerals. The tubing has a high dielectric strength, according to the manufacturer. Numerals of the customer's choice are printed on



the tubing with an ink that has resistance to chemicals, water and oils equal to that of the tubing, it is stated. Available in colored tubing with black or yellow symbols in ASTM sizes from No. 9 up to ⅜ in. I. D.

Fluorescent Unit (206)

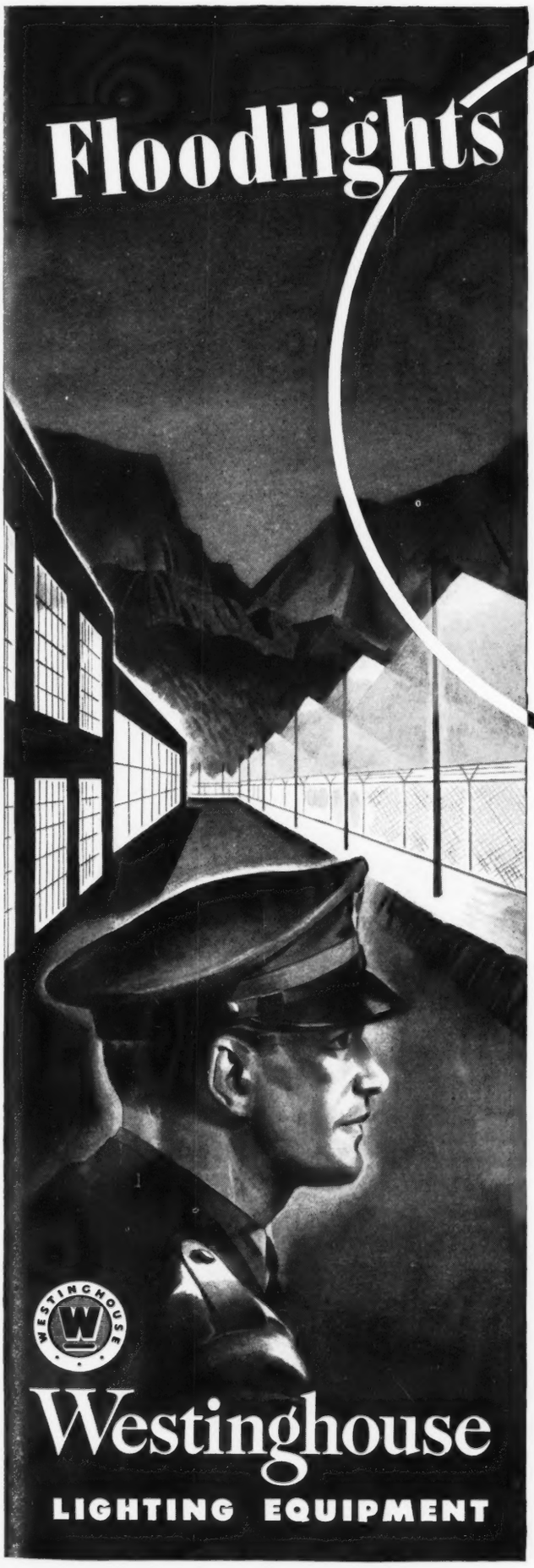
A fluorescent unit combining ballast and starting switch functions and called Insta-Lite has been introduced to the Spero Electric Corp. line. The manufacturer claims that the new unit will provide full intensity illumination the instant the switch is turned on. Made for two 40-watt tubes, for 110-125 volt a-c; available for industrial and commercial installation; non-metallic reflector.

Adjustable Hole Cutter (207)

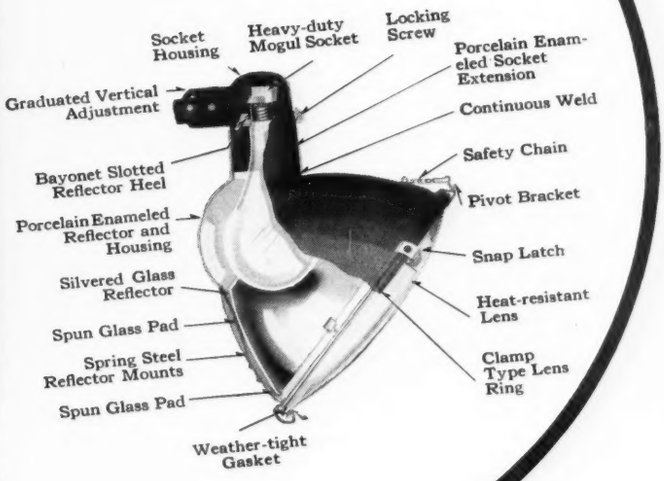
Robert H. Clark Co. has designed a 3-blade adjustable hole cutter for use in electric drills, pneumatic motors, drill presses, lathes, milling machines, etc. Capacity ¾ in. thickness; expansion range from ¾ to 4½ in. holes.

Molded Iron Cores (208)

Stackpole Carbon Co. has announced a new line of molded iron cores for frequencies as high as 150 to 175 megacycles.



DESIGNED TO Protect



NOW A COMPLETE LINE OF FLOODLIGHTS FOR EVERY WARTIME NEED

Our engineers have given eyes to the "night watch" with a new line of protective floodlights that help guard American war industries.

Westinghouse Types EH and EHG with universal lamp position, and VEG with vertical lamp position, are rugged, weather-tight units. And to meet a variety of lighting needs, a choice of narrow beam reflector (silvered glass) or wide beam reflector (porcelain enameled steel) with various lens and lamp combinations, is available. Both types of floodlights have graduated, locking adjustments to facilitate aiming and relamping.

For stand-by emergency lighting, Westinghouse Type E floodlights, with universal lamp position, are available in sizes from 75-watt to 1000-watt for wide beam application only.

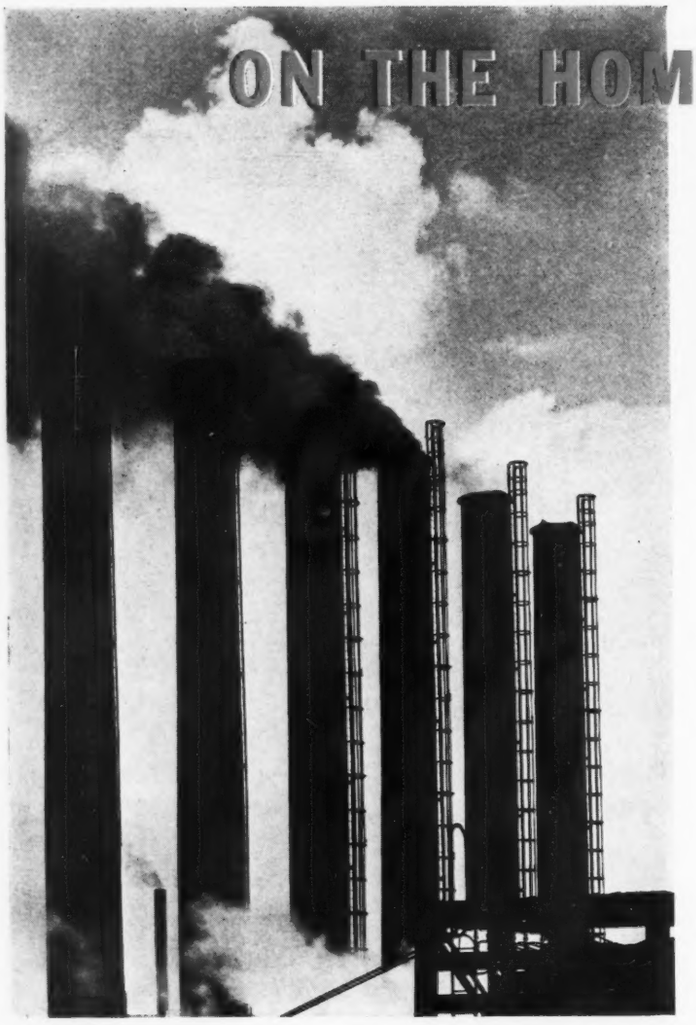
Producing this line of protective floodlights for America's "night watch" is an all-out job at Westinghouse today. And the nearest Westinghouse Lighting Distributor will gladly help answer any protective lighting problem you may have. Or, you may write for "Protection with Light" Planning Book, B-2280-A. Westinghouse Electric & Manufacturing Company, Edgewater Park, Cleveland, Ohio.

VARNISHED CAMBRIC • RUBBER POWER CABLES • BUILDING WIRE • RADIO

CRESCENT

is Helping to Win This War

ON THE HOME FRONT, TOO



In thousands of factories and shops whose production is devoted 100% to the war effort, power is supplied through

CRESCENT

Wire and Cable.

CRESCENT INSULATED WIRE & CABLE CO.

CRESCENT

WIRE and CABLE

Factory: TRENTON, N. J.—*Stocks in Principal Cities*

LOS ANGELES
Tri-State Supply Corp.
544 S. San Pedro St.

SAN FRANCISCO
Tri-State Supply Corp.
554 Bryant St.

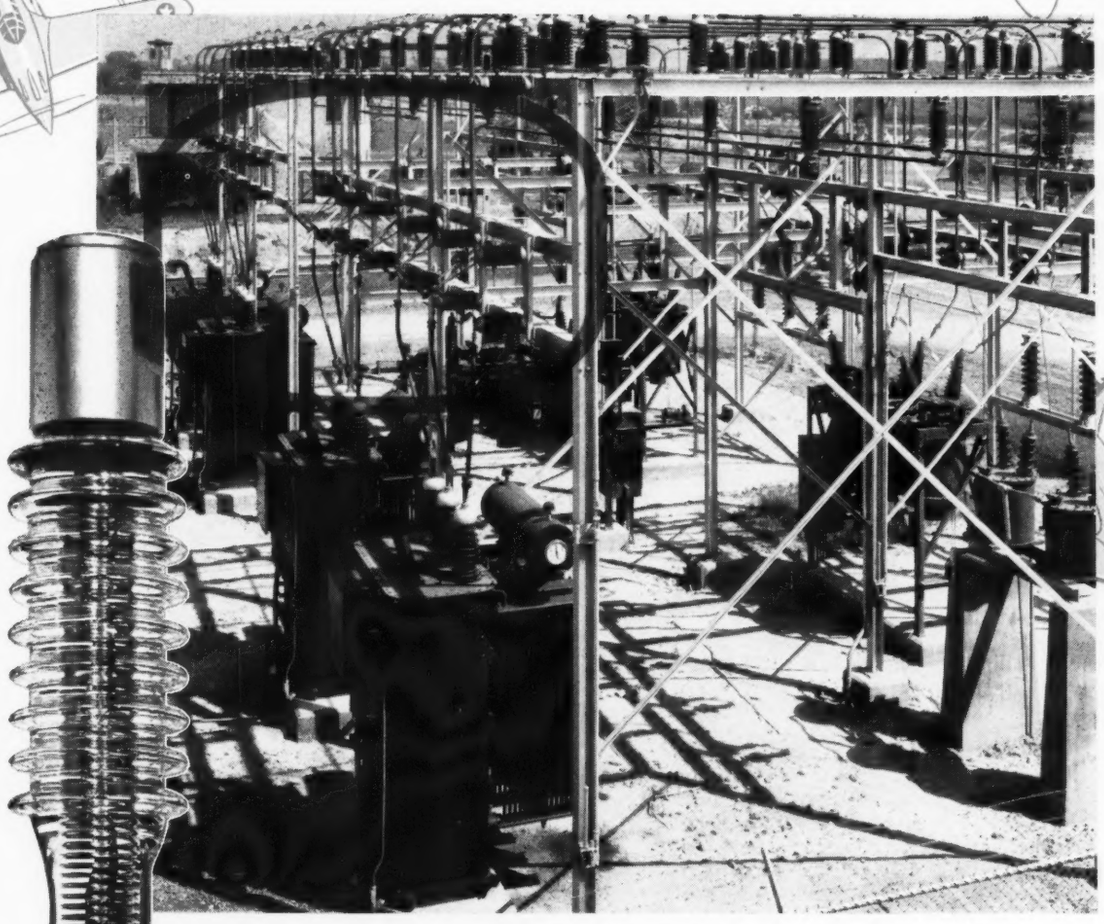
KANSAS CITY
W. F. Howe & Co.,
2627 McGee St.

CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE

CRESCENT ENDURITE SUPER-AGING INSULATION • WEATHER-PROOF WIRE

SERVICE CABLE • FLEXIBLE CORDS • LEAD-ENCASED AND PARKWAY CABLES • ARMORED CABLE

PROTECTING PLANE PRODUCTION



New Substation supplying electric power at airplane plant. Protection provided by S & C Type D Liquid Fuses for power banks—and S & C Type B-M RR-O Fuse-Resistor units for potential transformers. (At top, S & C Horn Gap Switches can be seen.)

S & C Liquid Fuses Again Selected To Protect Power Supply of Airplane Plant

AMERICAN industry attains wartime production rates by providing a high ratio of horsepower per workman, making continuity of electric service of utmost importance and adequate protection vital.

Substation shown at new airplane factory illustrates again the small space required for the S & C Liquid Fuse protection. This high interrupting capacity, time-tested, high voltage protection is provided while using a minimum of critical materials.

S & C Liquid Fuses are not destroyed when they operate,—they can be restored for service at our factory with a minimum of critical metals. They are available up to 400 amperes for use on system voltages up to 138KV, and may be obtained on short time delivery schedule.

SCHWEITZER & CONRAD, INC.
4435 Ravenswood Avenue **Chicago, Illinois**
Manufactured in Canada by Powerlite Devices, Ltd., Toronto, Ont.

LIQUID FUSES

EXPERIENCE WILL CHOOSE THE S & C FUSE

WESTERN REPRESENTATIVES:

SAN FRANCISCO
George E. Honn, 420 Market Street
LOS ANGELES
Farnham & Cunningham, Edison Bldg.

SEATTLE
T. S. Wood, 220 Ninth Avenue, North
SALT LAKE CITY
Rite: Engineering Co., Kearns Bldg.

CLEARS ANY NUMBER OF TRANSIENT FAULTS

PACIFIC ELECTRIC'S MOTOR-WOUND SPRING-ACTUATED AUTOMATIC SERVICE RESTORER TYPE AP-40,

15-kv.; 100-amps. Continuous; 1800-amps. Interrupting Rating

SAVES LABOR — NO ATTENTION *between Operations because of Automatic Electric Rewind*

Clearing *immediately* any number of transient faults, the *pole-mounted* Automatic Service Restorer, shown in a cut-away-view, offers full continuity of service to important loads.

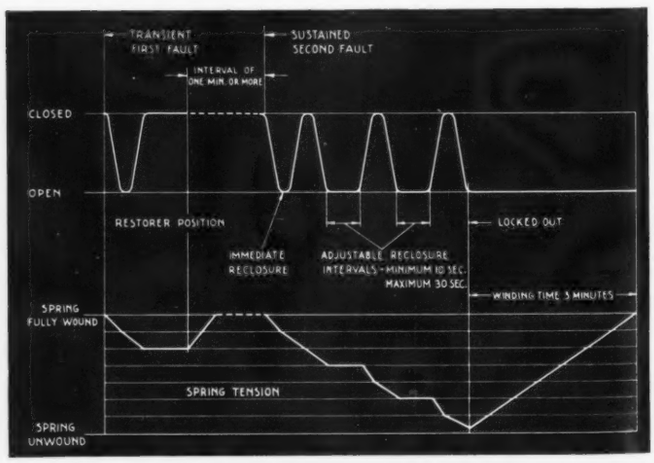
During one sleet storm a user reports 242 operations from one Restorer in eight days without lockout.

With fuse protection, what a bother—what outages that utility would have had!

But this Automatic Service Restorer, with its operating spring storing enough energy for four circuit openings, automatically rewinds after each tripping, so on transient faults you have any number of fault clearances.

Pioneered by the Pacific Electric Mfg. Corp., specialists in manufacture of high-voltage switching equipment, the outdoor Motor Rewound Service Restorer is giving reliable, safe service and assuring continuity of service the nation over.

Investigate its easy, positive *outside* adjustments of inverse-time-delay trip mechanism; 1800-ampre interrupting rating; fast arc extinguishment which saves on oil, saves on maintenance; special accessories and other features which assure fast clearance on any number of transient faults.



Typical Operating Cycles—Showing transient fault followed after 1 minute by a second sustained fault. Other special schemes available.

C. H. Cutter
1015 Securities Bldg.
Seattle, Wash.

U. N. Halliday
230 U. S. Nat'l. Bank Bldg.
Denver, Colo.

G. B. Kirkwood
437 S. Hill St.
Los Angeles, Calif.

J. E. Redmond Co.
448 W. Madison St.
Phoenix, Ariz.

Northwest Supply Co.
909 East 2nd St.
Butte, Montana

H. R. Slocum
P. O. Box 1926
Honolulu, T. H.

Other Representatives in Principal Cities

Pacific Electric Mfg. Corporation

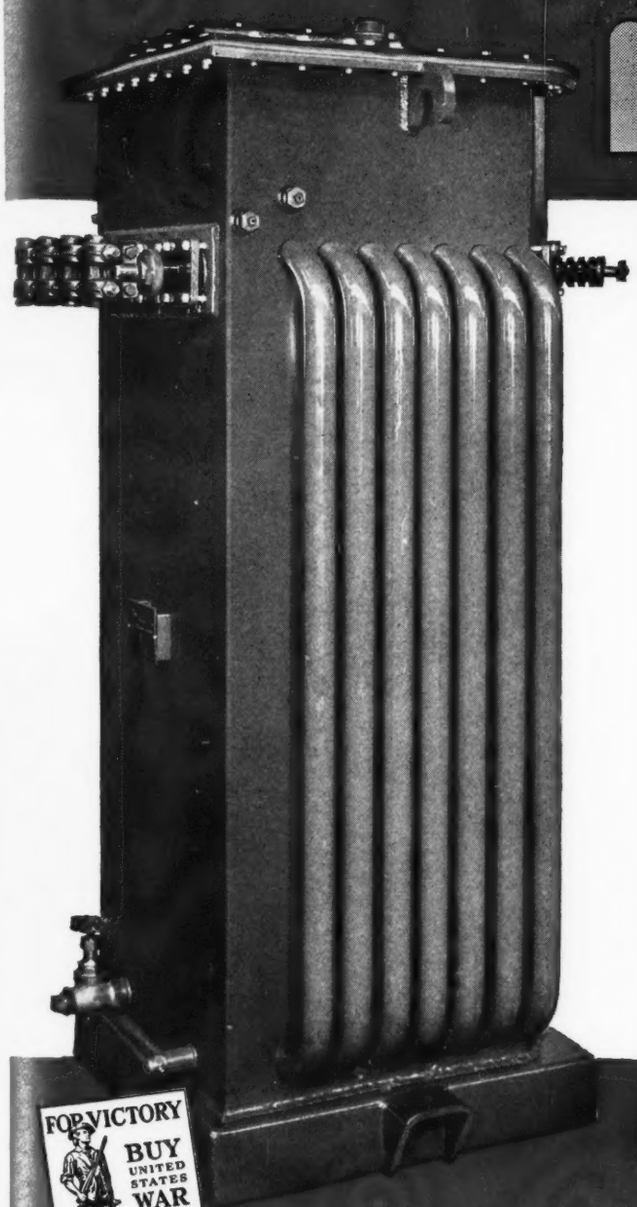
5815 THIRD ST., SAN FRANCISCO, CALIF. DUNES HIGHWAY, GARY, INDIANA

WAGNER

NOFLAMOL TRANSFORMERS

(NON-INFLAMMABLE LIQUID-FILLED)

Give you a combination of advantages worth investigating



★ **INDOOR INSTALLATION WITHOUT VAULT**

Noflamol transformers may be installed indoors without the use of expensive fireproof vaults since the liquid used in the transformers is non-inflammable. Considerable installation expense is thereby avoided.

★ **IMPROVED PLANT EFFICIENCY . . .**

Savings are effected by dividing the circuit into several sections and placing a Wagner Noflamol transformer at the load-center of each, eliminating long runs of secondary copper, reducing line losses, and improving voltage regulations. Plant efficiency is thereby improved.

★ **NO SPECIAL FOUNDATIONS . . .**

The only foundation necessary for installation of Wagner Noflamol transformers is a level floor, strong enough to support their weight.

★ **SAVES VALUABLE FLOOR SPACE . . .**

Wagner Noflamol transformers may be installed in out-of-the-way places, thereby releasing valuable floor space for production. Since no vault is needed, less space is necessary for a Noflamol transformer installation.

★ **SAVES MAINTENANCE EXPENSE . . .**

The liquid used in Noflamol transformers is chemically stable, has high dielectric strength, and will not sludge.

Bulletin TU-33 describing Wagner Noflamol transformers will be mailed on request.

T43-1

Wagner Electric Corporation

6400 Plymouth Avenue, Saint Louis, Mo., U.S.A.

TRANSFORMERS · MOTORS · BRIDGE BRAKES

"Take care of those pliers, son"

THE old-timer who knows good tools passes on the word to the "grunt" just learning "Good tools deserve good care." And today, when every tool that can be produced has a job to do licking the Axis, taking care of tools is an aid to winning the war as well as being good business.

Owners of genuine Klein equipment can rely on its high quality to assure maximum service. Proper care means longer life for tools which will be difficult, if not impossible, to replace during wartime.

ASK YOUR SUPPLIER. FOREIGN DISTRIBUTOR: INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK

Since 1857

Mathias KLEIN & Sons
Established 1857 Chicago, Ill., U.S.A.
3200 BELMONT AVENUE, CHICAGO

Acetate Winding Tape (214)

William E. Wright & Sons Co. is manufacturing an acetate fabric tape for coil winding. According to the manufacturer, varnished samples maintained flexibility during baking at 125° C. for 60% longer than cotton and it is stated that the tape has a moisture regain less than one-half that of cotton. Construction was designed to allow tensile strength of 47 lb. per inch and 7.9% elongation. Available in 3, 5, 7 and 10 mil. thickness and widths from ¼ in.

Explosion Proof F-Unit (215)

Appleton Electric Co. has announced an explosion-proof fluorescent unit which it claims eliminates the need for sealing fittings and accessories. A terminal block is provided to make line connections. Factory connections are made to the same block, eliminating splices. Reflector non-metallic, baked white enamel finish. Fixture is furnished with two 48-in. 40-watt lamps.

Insulation Remover (216)

A rotary wire brush has been developed by the Osborn Mfg. Co. to remove insulation from delicate electric conductors. The brush is made of mild steel wire .0025 of an inch thick and its surface is said to be as soft as velvet. It is in the form of a cylinder, 1½ in. in diameter and 2 in. long. The brush is recommended by the manufacturer for use in construction of radios and sensitive electrical instruments.

Voltage Regulator (217)

Burlington Instrument Co. has announced a new voltage regulator applicable to individual small a-c current generating plants having separate exciters. Simplicity of construction, dependability of operation, smooth and close regulation and light weight are features listed by the manufacturer. The regulator is said to be well suited to portable generating sets and to meet radio interference and regulation requirements of Signal Corps and Radar. Weight 10 lb.; height 9 in.; 6½ in. wide; 4½ in. deep. Suitable for control of single, 2 or 3-phase alternators and is normally furnished for 50-60 cycle operation. Available for 110-120 volts or for 208-240 volts.

for FASTER - BETTER WELDING
.....TIREX SUPER *Flexible* CABLES

TIREX Welding Cables are designed for use on welding jobs where speed is vital and results count. By using cables specially designed for welding equipment, time can be saved and output can be increased on maintenance, repair or new construction jobs.

The outstanding feature of TIREX Welding Cables is super-flexibility—obtained not only by employing a multitude of fine copper wires in the stranded conductor but also by the use of a specially applied cotton braid separator between the stranded conductor and the rubber jacket. This feature of super-flexibility, plus the exceptional electrical and physical properties of special TIREX rubber compound used, makes TIREX Welding Cable the ideal electrode cable.

RUBBER SHEATHED WELDING CABLE
Super-Flexible, Single Conductor

A. W. G. or M. C. M.	No. of Strands #34	O. D. Inches	Net Pounds per 100 ft.	Welding Current Capacity Amperes	Voltage Drop Max. Current Volts per 100 ft.
8	420	.39	10	50	3.71
6	686	.40	13	75	3.58
4	1078	.50	20	100	3.18
3	1372	.50	23	150	3.70
2	1715	.56	29	200	3.92
1	2156	.63	36	250	3.88
1/0	2695	.68	43	300	3.72
2/0	3381	.75	54	375	3.68
3/0	4263	.82	67	450	3.51
4/0	5341	.90	83	550	3.41
250	6321	.95	96	600	3.12
300	7595	1.03	115	650	2.80

All TIREX CABLES - for the duration - conform to government regulations controlling the use of copper and rubber. If you need cables to keep welding equipment going on war work you can avoid cable failures and replacements, save copper and the other critical materials and get the results you want with TIREX.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge, Mass.

ARMY E NAVY

Simplex
WIRES and CABLES

PACIFIC COAST OFFICES

390 Fourth St., San Francisco, Calif.
910 East Third St., Los Angeles, Calif.
503 Polson Bldg., Seattle, Wash.

He's Keeping a "Weather Eye" on Your WAR-ESSENTIAL Power Lines

Your GRAYBAR Representative is as alert as your own maintenance staff to emergencies of wind and weather.

His help begins before emergencies arise. Although GRAYBAR'S local supply stocks are not what they were, he can help you plan ways and means for getting what's critically needed, and suggest alternates to unavailable items.

Should storms strike with damaging severity, the whole network of GRAYBAR "mobilization points" can be called upon for supplies. And you'll get the backing of men from all over the country familiar with utility needs, experienced in helping meet emergencies like the New England Hurricane, the Ohio River flood and blizzards and ice storms beyond count.

Working with GRAYBAR on your day-to-day needs you have all the advantages of an organization in hourly touch with sources of supply across the country, an organization geared to travel the shortest routes through today's priority maze. And when emergencies do strike, you get the help you need . . . come hail or high water.

EMERGENCY "KNOW-HOW"
That Helps You
BEAT THE SLEET

PLANNING "KNOW-HOW"... based on GRAYBAR experience in emergencies dating back before the Blizzard of '88 and extending through three wars.

DELIVERY "KNOW-HOW"... backed by a nationwide network of warehouse facilities and the means for getting what's available to the point where it's most badly needed.

COORDINATION "KNOW-HOW"... resulting from long successful experience in serving *both* manufacturers and utilities.

MANPOWER "KNOW-HOW"... evidenced by the more than 20 years average experience of GRAYBAR Managers and Specialists.

GraybaR

IN OVER 80 PRINCIPAL CITIES

GRAYBAR — QUALITY — SINCE 1869 — * REG. U.S. PAT. OFF.

Everything Electrical . . . . THAT IT TAKES TO WIN!

Executive Offices: GRAYBAR BUILDING, NEW YORK, N. Y.

1,500,000 POUNDS ON THIS PORCELAIN TEACUP. Base insulators of this type, built to support, on a single point, guyed radio masts as high as 1,040 feet, must withstand a routine proof test of 1,500,000 pounds. In laboratory test they have not failed at 3,000,000 pounds. Mechanical—and electrical—strains of this order are never imposed on transmission insulators; yet the same porcelain, the same engineering talent, the same manufacturing methods go into the least spectacular of Lapp products. Lapp insulators on your lines merit your confidence. Because they are made from *better porcelain*, they are *better insulators.*

Lapp Insulator Co., Inc., LeRoy, N. Y.

ARMY E NAVY

Lapp

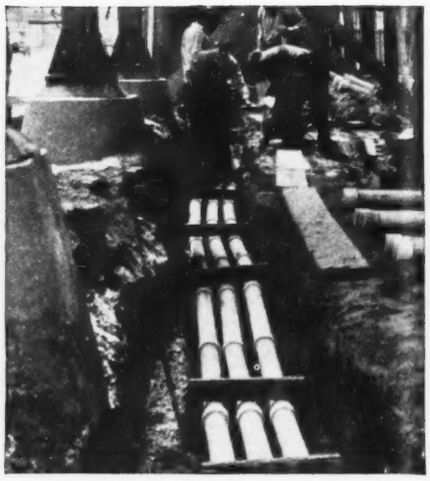
Better Porcelain • Better Insulators

For peak efficiency

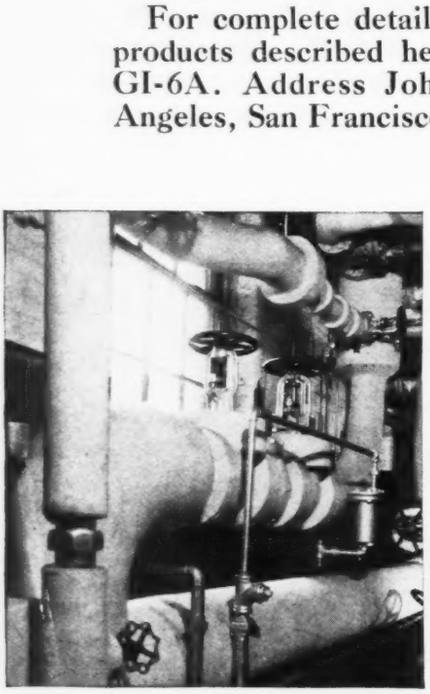
WARTIME RESTRICTIONS recognize the imperative need in the electrical industry for necessary repairs and maintenance. WPB Order Nos. P46 and P46-A grant specific permission to those possessing required priority ratings to purchase materials needed for this purpose.

To help you avoid waste, save fuel and cut costs, Johns-Manville brings you the knowledge accumulated during 85 years of experience. Throughout the electrical industry, J-M products are today contributing to the war effort, and will tomorrow be available for the resumption of peacetime activities.

For complete details on any or all of the products described here, write for Catalog GI-6A. Address Johns-Manville, at Los Angeles, San Francisco or Seattle.



TRANSITE CONDUIT. Made of asbestos fiber and cement, Transite Conduit is approved for use underground without Concrete envelope. Both Transite Conduit and Korduct help provide lower installation cost and reduced maintenance expense.



ASBESTO-SPONGE FELTED Pipe Insulation is recommended where maximum efficiency, high salvage and resistance to abuse are essential. Used alone for steam lines up to 700° F.; for higher temperatures, used in combination with Superex.

FIRECRETE CASTABLE REFRACTORIES. You can cast special shapes yourself . . . quickly and easily . . . and have them ready for service within 24 hours . . . by use of J-M Firecrete Castable Refractories. Ideal for poured door linings.

J-M SEA RING PACKINGS provide a minimum of friction on rods and plungers. They automatically seal on the work stroke, and release on the return stroke . . . thus reducing friction, minimizing rod wear, and conserving power.

JOHNS-MANVILLE PRODUCTS

JOHNS-MANVILLE

with present equipment

TRANSITE KORDUCT. Korduct is identical with the Conduit except for its lesser wall thickness. Like Transite Conduit, Korduct is fireproof and highly resistant to internal or external corrosion, electrolysis and action of soil chemicals.

DUXSEAL. A non-hardening, adhesive, plastic compound that will not slump or flow. Used for sealing the openings between cables and duct walls in manholes, service entrances, riser ducts, etc. Comes in 5-lb. pugs, 1-lb. packages and 70-lb. containers.

CABLE FIREPROOFING. Niagrite-Asbestoment, a commercially pure asbestos tape with or without reinforcement, which when wrapped on electrical cables and covered with Asbestoment (an efficient refractory) forms a fireproof protection.

J-M ELECTRICAL MATERIALS not shown here include:
Cable Trays, Asbestos Ebony, Moulded Ebony, Electrobestos, Asbestos Tapes, Friction Tapes and Splicing Compounds

OTHER JOHNS-MANVILLE PRODUCTS FOR THE ELECTRICAL INDUSTRY

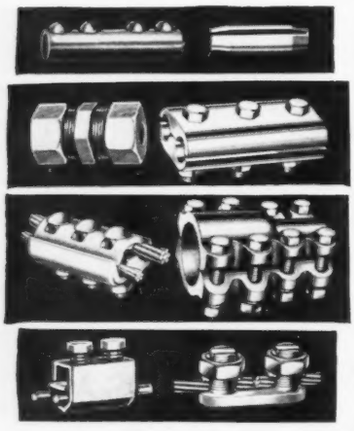
HIGH TEMPERATURE INSULATIONS
REFRACTORIES
TRANSITE PARTITIONS
ACOUSTICAL MATERIALS
PACKINGS
BUILT-UP ROOFING
INDUSTRIAL FLOORING
TRANSITE PRESSURE PIPE

ELECTRICAL MATERIALS

"It sure is HANDY— to have ALL kinds in One Catalog!"

For any good Straight or Parallel *Connector, see the* **COMPLETE** *line*

These illustrations can only suggest the wide variety in the Penn-Union Catalog . . . a *complete* line of Bolted Straight Connectors and Reducers . . . Screw type . . . Split Sleeve type . . . Shrink fit . . . Universal Parallel Clamps . . . E-Z Connectors that take a wide range of conductor sizes.



Also . . . the most complete line of Service Connectors, Tee Connectors, Cable Taps . . . Elbow and Cross Connectors . . . Bus Supports, Clamps, Spacers . . . Grounding Clamps, Terminal Lugs.

KENNETH ANDERSON CO.
334 East 4th St., Los Angeles

NORTHWESTERN AGENCIES
2411 First Ave., Seattle, Washington

F. M. NICHOLAS CO.
1123 Harrison St., San Francisco

Penn-Union Electric Corp., Erie, Pa.

PENN-UNION
Conductor Fittings

BULLETINS

data books, etc.

A-C Welders (218)

A 12-page booklet on a-c welders has been issued by Westinghouse Electric & Mfg. Co. Comparing a-c and d-c welding, the manufacturer states that the former increases output because of the absence of magnetic arc blow, ease in using heavy electrodes with higher currents and ability to make good welds in all positions.

Floating Arm Lamps (219)

Dazor Mfg. Co. has prepared a 16-page illustrated booklet describing its "floating arm" lamps. These units are available for fluorescent and incandescent lamps. Information is included on all models, including clamp and screw; pedestal; desk and bracket types. Data on circuit voltage, power factor, arm extension and prices is listed for each model.

Centrifugal Tachometers (220)

A bulletin giving specifications and applications of its centrifugal tachometers has been released by the Boulin Instrument Corp. Included are the single range hand tachometer; the stationary unit and the triple range centrifugal tachometer.

Dry-Type Transformers (221)

General Electric Co. has published a booklet on dry-type transformers for power and lighting circuits 600 volts and below. Contents includes application and construction information and data charts. Illustrated by photographs and diagrams.

Unit Substations (222)

Unit substations are described in a 34-page booklet issued by General Electric Co. The new publication lists construction and design features, diagrams of typical system arrangements, installation photographs and four pages of typical specifications.

Lighting Booklet (223)

"Red Spot Lighting for Combat Operations and War Production" is the title of a booklet released by the F. W. Wakefield Brass Co. Fluorescent and incandescent models are described and pictured. Specifications and data tables are included.

Recording Instruments (224)

Leeds & Northrup Co. has issued a 20-page catalogue describing Micromax frequency recorders and indicators. Manually and automatically operated instruments are included. Illustrated.

Welding (225)

Describing the new Weld-O-Tron, Allis-Chalmers has released a bulletin titled "Weld Thin Metals". Applications by industry and the armed services are illustrated in the 20-page booklet.

OUR MEN NEED ★ BOOKS ★

SEND ALL YOU CAN SPARE

That book you've enjoyed—pass it along to a man in uniform. Leave it at the nearest collection center or public library for the 1943 VICTORY BOOK CAMPAIGN.

"Where can I get the LATEST Information QUICKLY?"

During the coming 12 months Western Buyers will use the April Manufacturers' Directory issue of Electrical West—to locate all possible sources of materials and equipment. They will want to know about YOUR product—quantities available—priority status—deliveries.

You can help! Make it EASY for them to get full data in a hurry on your products—

***Manufacturers*—list the street addresses and telephone numbers of your western representatives or western branch offices.**

***Western Representatives* — call attention to the various lines you handle, along with your street address and telephone number.**

Advertising rates in the April Directory section are low—$3.85 per column inch. Get full details TODAY!

ELECTRICAL WEST
68 Post St.
San Francisco, California

To Our Customers and Friends:

"Megger" Testers are, as you can well imagine, in unusually heavy demand during these strenuous days. Now, if ever, electrical equipment *must not fail*.

Although the demand has been for a quantity of instruments many times larger than our normal pre-war volume, we have so far been able to fill most high priority orders on schedule. Ours is the unique responsibility of supplying America's electrical men who must maintain electrical equipment on land, on the seas and in the air—with a testing device that is a vital necessity.

To this end we are now concentrating on the building of the more generally used types of "Megger" instruments in our Philadelphia factory We have complete manufacturing facilities, a loyal group of skilled men and women, and above all the *determination* to see that you get all the "Megger" Testers you need—at the earliest possible date.

JAMES G. BIDDLE CO.
January, 1943

P.S.—*We urge you to inform us as soon as possible of your requirements for "Megger" instruments, so that we can plan our production to meet your needs.*

"MEGGER"
TRADE MARK REGISTERED U.S. PAT. OFF.
INSULATION TESTERS · GROUND TESTERS · OHMMETERS

JAMES G. BIDDLE COMPANY · 1211-13 ARCH STREET · PHILADELPHIA, PENNA.

SEED MONEY *will*

(This advertisement appeared in a group of newspapers on Tuesday, January 26, 1943)

WE DOUBT if a guy in a tank has much time to worry about how he is going to make a living when the war is over. That's the duty of the folks at home.

Thoughtful men in political life are beginning to talk about the need for assuring jobs not only for returning fighting men, but also for the millions who have found work in war production.

Vice-President Wallace has summed up the yearnings which all of us feel for a better world to follow this war in his phrase, "The Century of the Common Man."

► We think he means that if all of us can find fruitful work to do, we will enter upon a new era of happiness that grows not only from material well-being, but from a sense of personal accomplishment.

No one could ask for a better grasp of the objectives that stir the souls of men than has been shown by the leaders of both of our political parties.

The only difference of opinion that could possibly exist on such noble objectives is in the method by which the common man can be given his century.

► Most business men know that jobs and good wages make good business.

Most wage earners know that business must be healthy if it is to support good pay and give a job to everybody who wants to work.

Where we run into trouble is that we don't hold on to these simple facts when we make our laws.

If a law helps business, it helps the worker.

If a law SAYS it helps the worker, but really *hurts* business, it can never have the effect for which it was intended.

That isn't the fault of business. It's just another evidence of the supremacy of common sense.

► *Here's a simple formula for making jobs after the war:*

1. Remember that the United States invented machines and manufacturing methods that have given the highest standard of living in the world.

2. Good wages and good living result from

   a. More output per worker

   b. Less cost per unit produced

   c. Lower prices to consumers

3. Therefore, the only way to live better is through constant improvement in our machines and methods.

4. However, it is a natural political tendency to try to legislate good living. This cannot be done, except as legislation promotes sound industrial progress. *Industrial progress, not legislation, is the source of all good living.*

make jobs for soldiers

5. But good living depends upon constant development and use of new and better machines and methods. These things cost money.

6. Money for new machines and better methods must come out of the profits of business. (This reinvested profit of business is called SEED MONEY.)

7. To prevent a crop of war millionaires, Congress passed a law which not only accomplishes that objective, but also takes away SEED MONEY which business will need after the war.

8. If you want to see that every ambitious man has a chance to work after the war, write your Congressman and remind him that private profit and the SEED MONEY of business are two entirely different things. Business should be allowed to accumulate more SEED MONEY, for making post-war jobs. Lawmakers help make good living for you when they make laws that make good business. At the same time they create the best insurance for the Century of the Common Man.

"What's Good for Business is Good for Americans"

THE McGRAW-HILL NETWORK OF INDUSTRIAL COMMUNICATION

22 publications, which gather "war-news" from the "war-production-front" through a staff of 153 editors and 725 engineer-correspondents . . . More than 1,500,000 executives, designers, production men and distributors use the editorial and advertising pages of these magazines to exchange ideas on war-production problems.

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Publishers of technical, engineering and business books for colleges, schools, and for business and industrial use.

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Electric Refrigeration (226)

"Electric Refrigeration and Wartime Health," is being distributed by Westinghouse Mfg. Co. as one of the series of educational handbooks prepared by its Home Economics Institute.

Written for lunch room managers, home economics teachers and others concerned with food care and conservation, the 16-page booklet discusses proper refrigeration, effect of refrigeration on bacteria and vitamins, quick frozen foods, hints on buying food and on food storage.

Charts show recommended conditions for storage of different foods and recommended daily allowances for specific nutrients. Also included is an outline chart for a course of study on foods and refrigeration. A file copy of this booklet is available to teachers and home economists free of charge. Quantity requests can be filled at 5c per copy.

Fluorescent Maintenance (227)

A handbook on maintenance of fluorescent equipment has been published by Westinghouse Electric & Mfg. Co. In 5x7 size and containing 31 pages, this guidebook gives rules that can be applied to any fluorescent lighting installation. Wiring and other diagrams add to the usefulness of the booklet.

Among the subjects discussed are: power supply; lamp replacements; lamp and starter testing; fluorescent luminaire testing; methods of improving lighting efficiencies; radio interference; noise; low temperature operation. Also included are a fluorescent analyzer key sheet and a fluorescent check chart.

Wiremold Applications (228)

Wiremold Co. announces a new bulletin describing industrial application of Wiremold No. 3000 system wiring, used as a branch circuit feeder raceway for power and lighting circuits. This bulletin also covers applications and installation of Plugmold, convenience outlet systems for bench, work table, test rack and plant office service.

Lightning Protection (229)

Lightning protective equipment for a-c rotating machines and a-c side of rectifier equipments is described in a 16-page bulletin released by General Electric Co.

Data and diagrams give information on protection of machines connected to exposed overhead lines directly, through transformers and both directly and through transformers; protection of synchronous converters, d-c machines and rectifiers.

Also included are a guide for selection of arrester rating and tables listing prices and other data.

Panelboards (230)

Frank Adam is distributing Bulletin No. 67 on FA panelboards. This bulletin includes descriptive material, diagrams, illustrations and price lists.

Electronics (231)

The story of electronics—its history and future possibilities—is told in a new General Electric Co. bulletin, titled "Electronics—a New Science for a New World." Presented in attractive foremat, this booklet tells by word and picture how the electron is working today in war combat, research, industry, radio and television, agriculture, medicine.

Industrial F-Units (232)

Edwin F. Guth Co. has published a series of folders on seven new industrial fluorescent lighting units. Included are masonite reflectors, non-metallic shielding eggcrates, "for lamp" units, mechanic's portable and quick-starting fluorescent units. Prices and sizes are listed.

Motor Control (233)

A bulletin on synchronous motor control has been issued by General Electric Co., explaining the primary and additional functions performed by the various G-E controllers. Also described are the several metal cabinet-type enclosures available for protecting these controls.

Electric Drills (234)

A handbook published by the Black & Decker Mfg. Co. shows correct methods of using portable electric drills to obtain greatest efficiency and longest life from these tools. This booklet contains sections on assembly, grounding, motors, care of cable, drill chucks and bit, lubrication and other information.

Tungsten (235)

Cleveland Tungsten, Inc., has prepared a booklet on Tungsten, its origin, properties, manufacturer and uses. This 12-page bulletin is illustrated by photographs and drawings.

ELECTRICAL WEST, 68 Post St., San Francisco, California.

Please send me information about the following CIRCLED items:

200	201	202	203	204	205	206	207	208	209
210	211	212	213	214	215	216	217	218	219
220	221	222	223	224	225	226	227	228	229
230	231	232	233	234	235				

Name..... Company*..... Title*.....

Address .....

* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

TO ELECTRICAL MEN EVERYWHERE

You Can Save Even More Copper than We Can

In many respects, copper is more valuable than gold. For without it, we, as manufacturers, cannot produce the machines that keep plants humming; without vast amounts of it we cannot produce the electric equipment needed in such large volume by the Army and Navy.

In every G-E plant—in every G-E design office—we are spending thousands of man-hours to the end that not one pound of the "electrical" metal shall be wasted. Our engineers in the field have a similar objective—to help you save copper in the *application* of electric equipment.

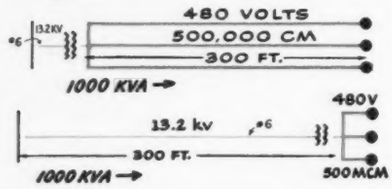
For many months we have been making available to everyone the more significant, the most useful facts pertaining to copper conservation. Witness the several publications shown here, and described further in the following pages.

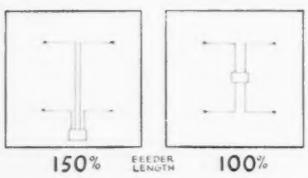
From all these facts, one conclusion stands out clearly. You men in the field—collectively—by making proper application of cable, transformers, motors, control, and other devices, can save even more copper than we can. You can save more in days than a manufacturer can save in months, just by making the right applications. We urge you to study the facts and lend your best judgment to the highly important job of conserving this most precious metal. *General Electric, Schenectady, N. Y.*

The Army-Navy "E", for Excellence in the manufacture of war equipment, now flies over six G-E plants employing 100,000 men and women.

GENERAL ELECTRIC

FOR NEW PLANTS OR PLANT EXTENSIONS, REMEMBER THESE SIMPLE COPPER-SAVING RULES





To carry 150 kva — 3 phase —

At 208 volts, requires this size copper conductor

At 240 volts, requires this size copper conductor

At 480 volts, requires this size copper conductor

A detailed explanation of these principles is available in our recent publication, "5 Ways to Conserve Copper." Ask for GED-1011.

1. Cover as much distance as possible with high-voltage circuits. Keep the low-voltage (heavy copper) circuits as short as possible.

2. Locate substations in the centers of load areas. Modern safety-enclosed unit substations make this practicable.

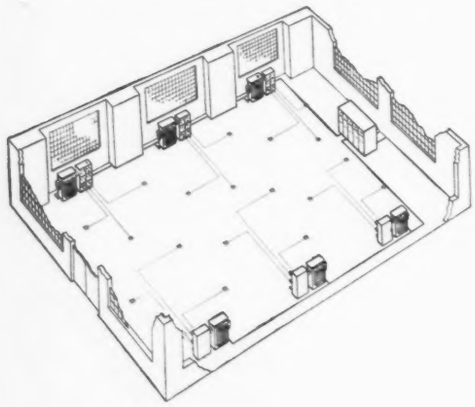
3. Use small-size substations. You save copper that way; but they must not be too small or your use of materials won't be economical. The optimum substation ratings for 480-volt secondaries are 750 and 1000 kva; and for 208/120-volt or 240-volt secondaries, 300 and 500 kva.

4. Distribute power at the highest practical voltage. For example, choose 440 volts for your integral-horsepower-motor circuits in place of 220 volts.

5. Use cable with high-temperature insulation to carry more current—varnished cambric instead of code rubber.

IF YOU SUBSCRIBE TO THESE PRINCIPLES YOU'LL WANT A COPY OF THIS BOOKLET...

GED-1006



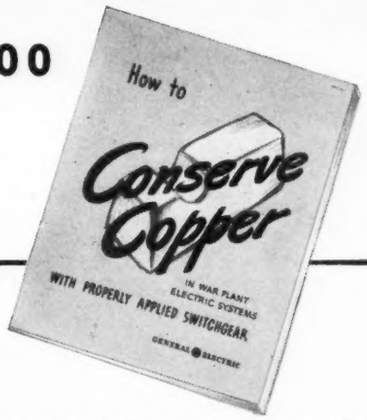
One of the important developments in electric power systems since the war began is the load-center method of distributing power in industrial plants. This is based on the use of compact, factory-assembled, load-center unit substations, as shown in the illustration at the left.

Power is distributed at relatively high voltage (2.4 to 13.2 kv) within the plant to load-center unit substations located near the centers of electrical load areas. There it is stepped down to utilization voltage (below 600 volts) and distributed to the load through drawout air circuit breakers and *short* secondary feeders. By keeping the heavy secondary feeders to the minimum length, considerably less copper is required, and the performance of motors, lamps, etc., is materially improved by the resultant reduction in voltage drop.

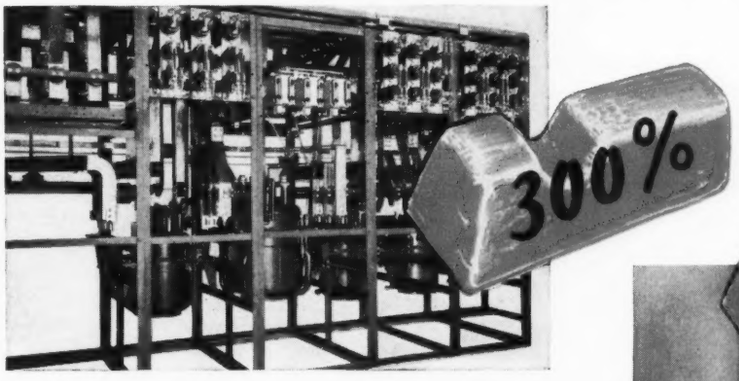
GENERAL ELECTRIC

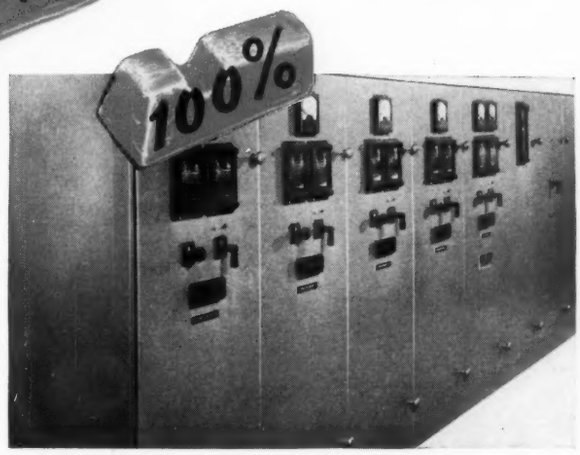
THE RIGHT KIND OF SWITCHGEAR, TOO MEANS COPPER SAVED

—AT LEAST 60%, ON MOST JOBS



Write for Bulletin GES-3031, on how to save copper through properly applied switchgear.



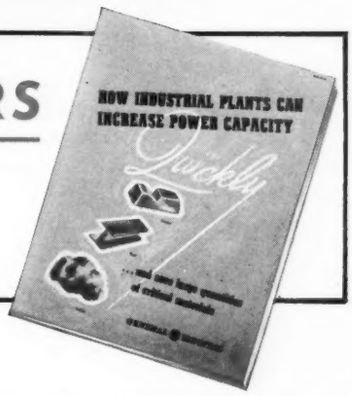


Open-type switchgear—with many strung-out copper interconnections mounted on a bulky, structural-steel framework—calls for a lavish use of copper.

Safety-enclosed switchgear is compact, and its copper interconnections are short. What's more, it completely eliminates the copper disconnecting switches seen in the open-type assembly (above), because modern vertical-lift breakers can be quickly and easily connected and disconnected from the main buses. These and other savings regularly cut switchgear copper requirements to less than *one third*.

CAPACITORS ARE GREAT COPPER SAVERS

They provide increased power capacity without adding new generators, transformers, or feeders.



1 INSTALLATION OF FOUR NEW CIRCUITS

	Critical Materials Required (pounds)			
	Copper	Steel	Others	Total
3 New 250-kva single-phase transformers	1525	8100	---	9625
4 New feeder circuit breakers	562	1800	512	2874
Cable for 4 new feeders	4940	---	1230	6170
	7027	9900	1742	18669

2 INSTALLATION OF CAPACITORS

	Critical Materials Required (pounds)			
	Copper	Steel	Others	Total
15 capacitors—90 kva each (One capacitor installed at each load center)	360	2370	2145	4875
SAVINGS IN CRITICAL MATERIALS	6667	7530	-403	13794

Consider a typical industrial plant 400 ft by 750 ft, which has a peak load of 3000 kva, served by 15 circuits, each carrying 200 kva. Because of a large amount of inductive equipment (motors, welders, etc.), the power factor of the circuit is only 75 per cent.

To meet demands for increased production, 718 kva of new power-system capacity must be supplied. You can install four new circuits of 200 kva each. Or you can install capacitors on each of the present circuits. The tables at the left compare the two methods. See how 13,794 pounds of critical materials (6667 lb copper) can be conserved. Incidentally, the capacitor method costs about half as much as the installation of new circuits.

How Industrial Plants Can Increase Power Capacity Quickly—and save large quantities of critical materials—is the subject of a new booklet (GES-3039) now available through your local G-E office.

GENERAL ELECTRIC

YOU MAY BE ABLE TO SAVE 25% IN *CRITICAL MATERIALS* BY MODIFYING YOUR PEACETIME MOTOR POLICY

The new G-E MOTOR FITNESS MANUAL tells what to do to get the most out of motors, old and new. If you are undertaking new work on motor-equipped machines, if you are "switching" motors from one job to another, or equipping machines with new motors, you'll find this bookful of helpful motor facts will save you valuable time. Included with it is another new publication—"How to Save Critical War Materials." This contains the latest WPB recommendations for the selection of motors, and other useful data. Write today for your "MOTOR FITNESS MANUAL, GED-1017."

MOTORS NEEDLESSLY LARGE FOR THE JOB—plus the oversize distribution circuits they require—may be 25 per cent or more on the side of the enemy! That's the percentage of copper and other scarce materials frequently wasted by overcautious motor specifications—by buying the "next larger size" than a machine actually needs.

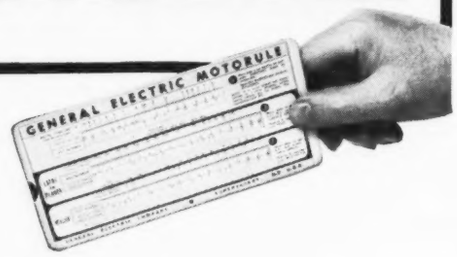
The extra amount of critical material used in the oversize motor itself is only part of the loss. Operating a motor continuously below its rated capacity can mean wasted copper all the way back to the power plant. Therefore, even your present motors should be so applied as to avoid "overmotoring," wherever possible.

Why not check with your engineers to see if your peacetime motor policy can be modified in the cause of conservation? You'll be helping to make more metals available where they're needed most to win the war.

This new load calculator—the G-E MOTORULE—makes it easy to select motors that match the job when the recommendations of the machine builder are not available. It helps avoid the risk of undermotoring and the waste of overmotoring. With this motorule, you can check to make sure you are getting the most out of all your machine motors, old or new.

Accurate—easy to understand—applicable to the working of a wide range of materials. FREE with full instructions from your G-E Motor Representative or direct from General Electric, Schenectady, N. Y.

FIND METAL-CUTTING HORSEPOWER *QUICKLY* WITH THE G-E MOTORULE



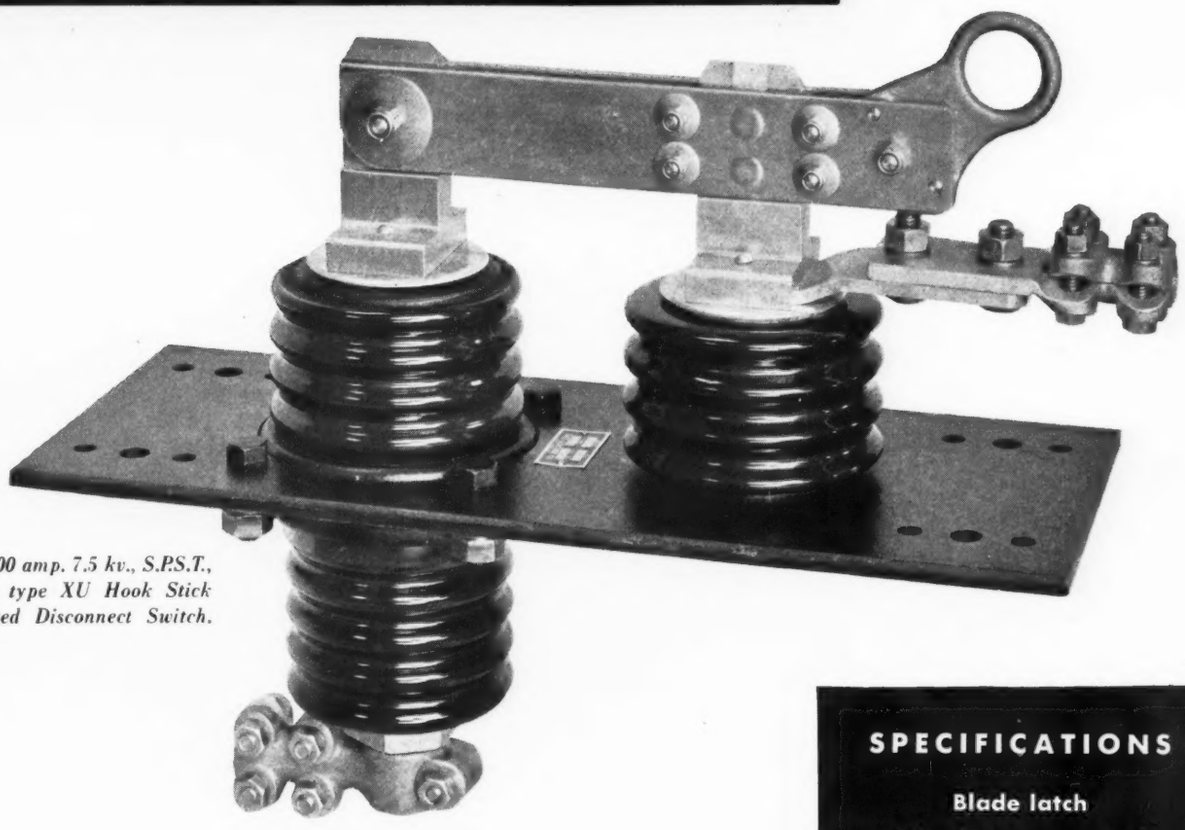
NEW DEVELOPMENTS IN FLUORESCENT LIGHTING SAVE BOTH *COPPER AND STEEL*

The new G-E Forlamp (265-volt) ballast for war-plant fluorescent lighting operates four 100-watt lamps—twice as many as any ballast previously available. And it's the same size as the Tulamp 100-watt (118-volt) ballast.

This means a saving of 50 per cent in critical materials in plants where voltages within the 250–280 range are available. Furthermore, large savings of copper can be made in the lighting circuit, too, since this ballast operates on circuits of 277/480Y volts. Single-phase circuits of 277 volts require from 60 to 70 per cent less copper than those of 120 volts. Ask for publication GES-3033.

GENERAL ELECTRIC

WAR LOADS DEMAND SWITCHES THAT CAN *TAKE* IT



Cole 600 amp. 7.5 kv., S.P.S.T., indoor type XU Hook Stick Operated Disconnect Switch.

SPECIFICATIONS

Blade latch
Clip, front connected
Hinge, back connected
Mounting, flat or pipe
Silver to silver contacts
Low temperature rise
Blade stops if required

Today's demands frequently cause overloads. Cole Switches can take them in stride, and not like many people, they do it without grumbling. They are ruggedly designed and then manufactured to precision standards. Cole Switches, both indoor and outdoor types, are manufactured for all voltages and amperages.

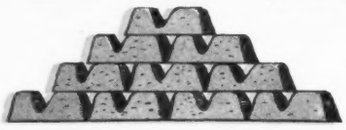
Cole Electric Company

1510 SOUTH LOS ANGELES STREET, LOS ANGELES, CALIFORNIA

Western Representatives

CONDON & YOUNG, INC.
357 SOUTH HILL STREET, LOS ANGELES

EICHER & BRATT
COLMAN BLDG., SEATTLE, WASHINGTON

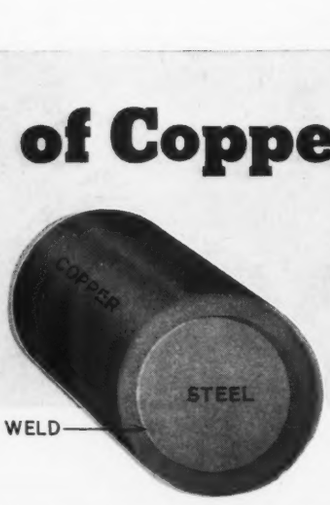
When this much copper will carry the electric load and protect from corrosion--it is wasteful to use this much  for mechanical strength. Copperweld can use this much copper and this much steel---and do the same job with a clear saving of 70% copper.

COPPERWELD STEEL COMPANY · GLASSPORT, PA.

Save hundreds of tons of Copper

with COPPERWELD

(COPPER-COVERED STEEL)



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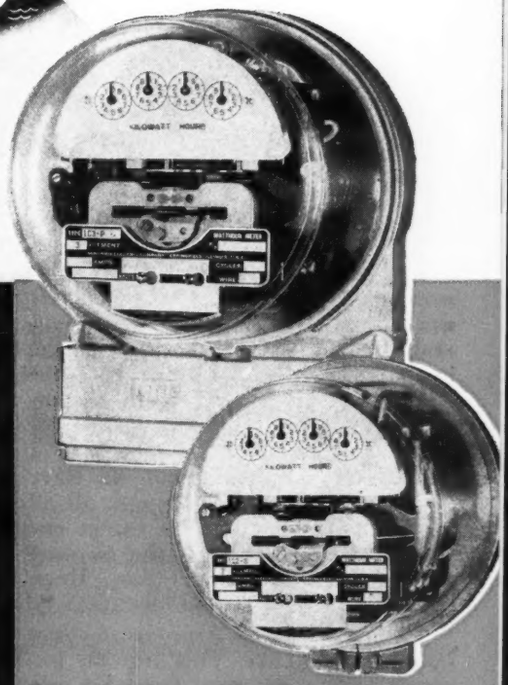
WAR BONDS MAKE UNCLE SAM MORE POWER-*full*

"On Measurement is founded the whole progress of man.."

The French Revolution did unto scientific researches as it did to many other things—blew them up and let them lie where they fell. One ten-millionth of the distance from the equator to the pole was designated as the "meter". To establish it, two French scientists measured the distance from Dunkirk, France, to Barcelona, Spain, in 1792. They found themselves dodging hostile efforts of all factions; in addition, the accuracy of their findings was doubtful. Yet, that was the conception of standardization. Compare it with today's high standard of measurement of electricity set and met by the electric utilities and the manufacturers of watthour meters.



NO OTHER COMMODITY IS MEASURED SO *Accurately* AS ELECTRIC POWER

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

ELECTRA'S HUSBAND

Engineers Become Bakers

"MRS. JONES told me today that the Army and Navy want 100 top flight electrical engineers for officer's commissions," Electra said the other evening as we sat waiting for the 10 o'clock news. "Her husband wants to apply. What do you think about it?"

"It's fine," I answered. "I wish I could qualify. But the Army ought to sift its present personnel. There are a lot of good engineers buried in the ranks by the machinery of the draft. I heard about a case today that would make you sick."

"It must be bad if you complain about it," was her comment. "Tell me about it."

"You didn't know Billy Brown, one of the electrical engineers for the power company just across the state line. He was a fine boy—U.C. graduate, 35, married, no kids. He figured he belonged in this show and he knew both the Army and Navy wanted engineers, particularly electrical engineers. So way last May he started trying to get a commission. He was like me—the Navy had the most appeal. He met all of the necessary requirements except one—he took two cracks at the physical examination and couldn't pass. Heart murmur, the doctors said.

"So he tried the Army next—went clear to Salt Lake. This trip he was armed with a statement from his own doctor that his heart murmur was congenital and meaningless. He had had it since birth and would have it when he died. But the Army didn't think so. They admired his engineering qualifications, but didn't like the heart murmur. Someone told him the Marines were less critical, particularly if you had what it takes and Bill did. But the heart murmur stopped him again."

"He should have been convinced by that time," Electra interrupted. "What did he do then?"

"Well, he went home thinking that maybe engineers weren't in such demand after all. He stuck to his job, figuring that perhaps working to see that half a dozen Army Camps, air fields, ammunition dumps and war plants had electric power, was a pretty big war contribution in itself. It was until last December. Then his draft board ran short of 1-A's. You know the rest."

"Didn't the draft board doctors turn him down," Electra asked.

"Nope," I answered. "They took him, heart murmur and all."

"Then they put him in the engineers," Electra commented.

"Wrong again," I said. "They made him a baker. He's baking bread down at one of the big camps in the south."

"That's only an isolated situation," Electra said. "You told about it just to make out a case against the draft."

"Do you think so?" I asked. "Then how about Bob Towne of our outfit? He wrote the other day and said 'an engineer in the medical corps is like a duck out of water, but I understand I'm here for the duration. Don't let any other men believe, as I did, that the Army's classification system is efficient. It ain't. The reason I'm here is simply that it was my misfortune to arrive at Fort Devens at a time when they needed 500 men to form this unit.' So there you have it—engineers as bakers and engineers as doctors' assistants. I don't know what they would make me."

"You always said engineers were versatile. Maybe they'd make you a WAAC," Electra mused just as the radio announced, "News flashes . . ." and she turned up the volume enough to drown out my howl.

THE operating superintendent of a small power company showed me a letter the other day he has written as a last resort in an effort to stop the flood of questionnaires and reports demanded by various government agencies. It goes something like this:

"Dear Sir:—

"You letter asking that we fill out Form PD-7546-OCD-115143 covering our annual use of galvanized bolts in sizes ½x4 and up for the years 1940 and 1941 has been received. We are sorry to report that the only man with the necessary knowledge to supply this information has been sent into the field to operate one of our substations. He takes the place of an operator who was just drafted. That operator also had taken the place of another who had been drafted. Were it not for that fact, perhaps we could comply with your request.

"P.S.—Sorry but the man I mentioned earlier in this letter just reported that he had been drafted. I must leave to operate the station myself until a replacement can be found.

"P.P.S.—Now the report will have to wait for the duration. I have been drafted."

REMEMBER those second and third grade arithmetic lessons where the teacher emphasized that you couldn't add, subtract or divide apples and oranges or cows and pigs? Well one of the rural electrification specialists now points out that the War Manpower Commission has changed all that. He comments also that appliance dealers, electrical contractors and power company accounting departments will now have some official values for barter trading in the rural districts. He bases his statements on this item:

"If cows become currency, there now is an official rate of exchange. To effect its program of increased production and manpower conservation on livestock, poultry and dairy farms, the War Manpower Commission has decreed that 12 milk cows, or their equivalent in poultry and/or livestock, shall constitute draft deferment grounds for one skilled farm worker, additional deferments in proportion.

"For this purpose WMC rates a single milk-producing cow as equivalent to 8.5 hogs (raised), 3.2 beef cows, 4.8 yearlings, 3.9 two-year old steers, 3.5 feedlot cattle, 16.5 ewes, 80 feedlot lambs, 74 hens, 250 chickens (raised), 500 broilers or 40 turkeys (raised).

"Any combination of the foregoing animal life, in an aggregate equivalent to a dozen cows, enables a local draft board to reclassify one 3-A essential farm worker as 3-B. The vistas which this system opens up to the authors of arithmetic textbooks are extensive."

Electra, who was raised on a farm, commented that some pedagogical professor must have worked out the ratios. She says that she would like to play around with that kind of currency. According to her figures, it makes a $150 dairy cow equal to $800 worth of lambs. She thinks it is the same kind of arithmetic that has created shortages where none existed and that has aggravated rather than alleviated real shortages. Blundering she calls it, pointing out that her cousin and a lot of dairymen like him lost 83% of the men who left their farms to high-pay war industry jobs.

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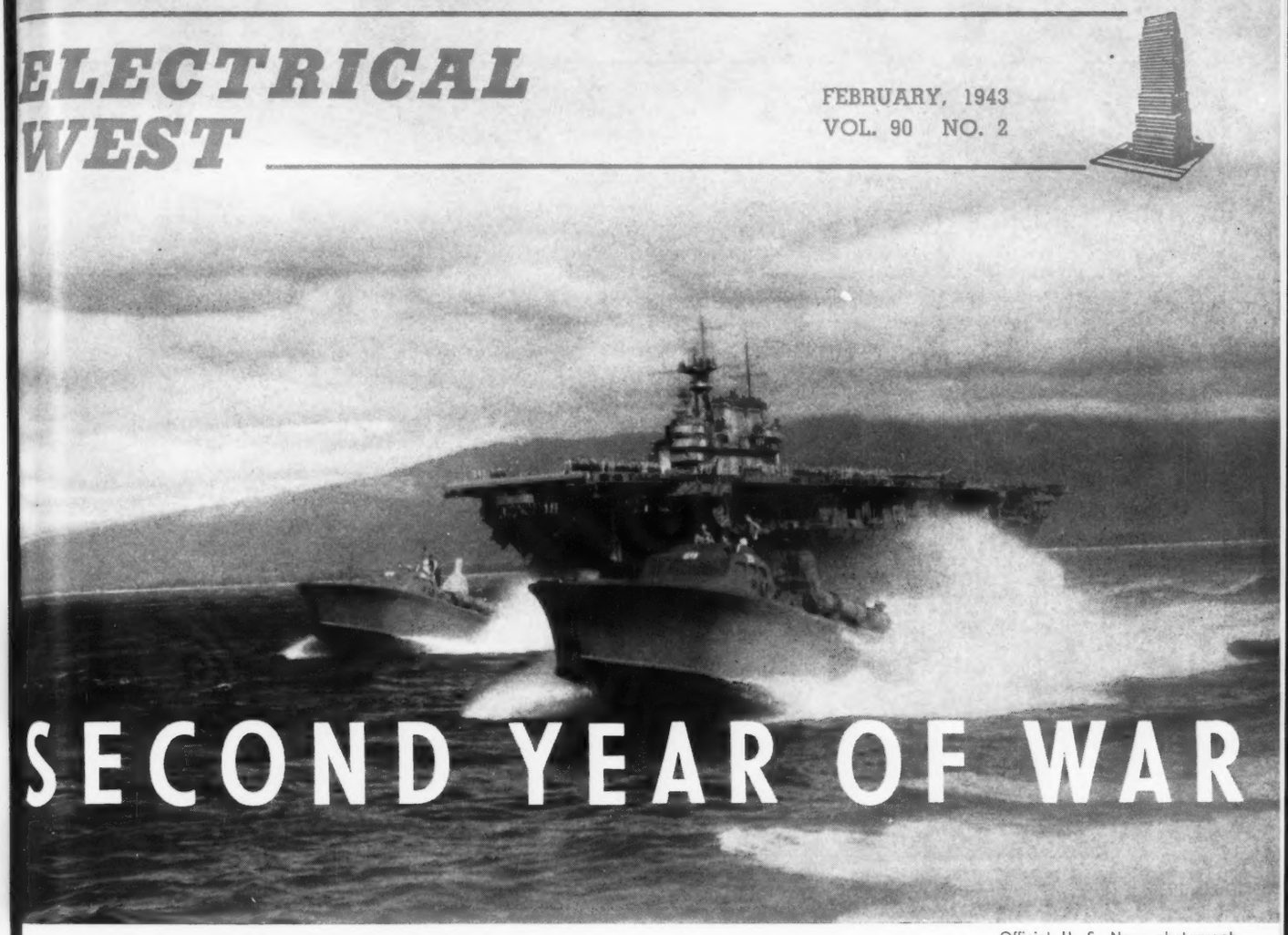
ELECTRICAL WEST

FEBRUARY, 1943
VOL. 90 NO. 2



SECOND YEAR OF WAR

Official U. S. Navy photograph

THE STABILITY and resourcefulness of the electric light and power industry is again being demonstrated by the present war emergency. All demands for electricity for munitions and armament of the armed forces have been successfully met in every section of the nation; the requirements for civilian use have been covered without resort to curtailment or rationing and the margin of reserves for the country as a whole has been increased substantially over last year's levels.—C. W. Kellogg, president, EEI.

From the Rockies to the Coast, from Canada to Mexico, power plants, power lines and trained people have met successfully and courageously every challenge thrust upon them by the emergencies of war. Power supplies have been adequate; they have been ready for war plants or war cantonments ahead of schedule. The complexities of material shortages and priorities have been tackled and overcome. Almost unprecedented natural obstacles in the shape of drouth, floods and blizzards have been faced with the industry's traditional ability to carry on, come what may.

Fourteen months of war have simply emphasized the transitional steps that followed December 7, 1941: Occasional blackouts have been converted into a coastwide dimout, with attendant problems of control and load decreases; manpower has answered the call to the armed forces and women now perform many tasks in the industry formerly reserved solely for men; load-building energies have been transformed to utilization services, guiding customers in efficient use of their electrical supply; ingenuity has been taxed to produce alternative materials, designs and techniques to replace those scarce stocks of critical goods devoted solely to war.

In a word, the industry has put every human and material resource into the war effort. The second year of war has brought a deeper realization of the tasks and sacrifices ahead if the nation is to win ultimate victory quickly and completely. To this end, every operation in the industry has been streamlined in accordance with experience gained from the war's impacts in 1942, and in anticipation of further sacrifices.

> "Three and one-half times as many aircraft—bombers, fighters, transports, observation and trainers—were produced in 1942 as in 1941. Production of guns, large and small, and of tanks and ammunition, was six and one-quarter times 1941 production. Naval vessel production was two and three-quarters times and merchant shipping five times." *Office of War Information.*

Western power production, too, climbed to new heights as demands from new war plants rose in step with the Western industrial revolution that grew in strength and size. The seven hundred odd power plants in this region upped 1942 kilowatt-hour generation 18.4% over 1941—an all-time record. Almost 5 billion more kilowatt-hours were produced, bringing the total for the year to 31,902 million kwh. This compares with a national growth of only 9.3%.

Any doubt as to the preponderantly greater electrification here in the West than elsewhere in the nation is further dispelled by figures on average use. For this region average generation per customer in 1942 was 7,380 kwh. as compared with a national figure of 5,760 kwh. In 1941 the rates were 6,415 and 5,360 respectively. Similarly Western generators work longer hours — the average kwh. output per kw. of installed capacity being 4,440 as compared with 4,147 for the U. S. Comparative figures shown in Table I indicate other outstanding characteristics of the Western electrical industry. Water power continues as the principal source of electrical energy with more than 90% of all electricity generated in 1942 coming from that source.

Table I—Comparison of National to Western Operations for 1941 and 1942

	11 Western States		United States		Percent West to U.S.	
	1941	1942	1941	1942	1941	1942
Energy Generated (Millions of Kwh.)	26,944	31,902	168,003	183,703	16.0	17.4
Energy Generated in Hydro Plants (Millions of Kwh.)	23,702	27 945	53,712	62,101	44.1	45.0
Energy Generated in Fuel Plants (Millions of Kwh.)	3,242	3,957	114,291	121,602	2.0	3.2
Percentage of Hydro to Total Generated	87.7	90.6	31.9	33.9	—	—
Installed Generator Capacity (Kw.)†	6,849,160	7,326 230	43,491,371	46,110,047	15.7	15.9
Installed Hydro Capacity (Kw.)†	4,571,207	4,974,864	11,949,170	13,158,457	38.3	37.8
Revenue From Energy Sales (Thousands of Dollars)‡	358,000	379,000	2,665,057	2,853,000	13.4	13.3

† Source. Federal Power Commission. ‡ Data from EEI.

Table II—Ten-Year Generation Record For Western Public Utilities

(Thousands of Kilowatt-hours)

State	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942*
Arizona	404,319	280,898	295,668	344,939	377,797	510,483	717,825	696,787	1,327,485	1,404,299	1,459,689	2,523,536
California	8,794,742	7,948,447	8,029,298	8,561,951	9,060,296	10,091,716	9,632,178	9,426,519	9,403,588	9,788,869	10,383,352	11,548,612
Colorado	528,813	478,263	459,493	506,710	549,157	652,404	721,482	731,395	760 445	791,967	818,213	925,134
Idaho	796,354	584,989	594,528	685,069	672,466	796,430	972,212	992,278	1,126,518	1,175,305	1,142,341	1,233,536
Montana	965,990	635,093	922,814	867,504	1,296,199	1,452,390	1,319,637	1,324,151	1,575,016	1,769,124	2,177,623	2,240,838
Nevada	19,067	32,749	24,271	32,152	27,719	171,499	1,152,788	1,491,205	1,855,042	2,324,176	2,403,747	2,321,140
New Mexico	179,658	157,614	157,482	173,229	190 744	214,602	255,378	262,124	281,508	316,862	368,449	405,028
Oregon	1,176,988	969,031	965,847	1,002,338	1,083,818	1,250,421	1,392,177	1,253,615	1,484,468	1,739,903	2,909,772	3,558,832
Utah	276,471	275,476	237,399	206,706	309,835	418,194	507,415	340,172	425,474	577,641	564,812	591,429
Washington	2,572,152	2,486,746	2,438,824	2,747,366	2,981,621	3,273,148	3,734,715	3,400,683	3,642,610	3,944,184	4,499,031	6,312,163
Wyoming	94,539	84,646	78,964	81,856	93,779	114,755	131,139	139,205	141,135	184,701	217,343	241,446

* F P C reports for 12 months ending November.

Table III—Utility Customers by Classes for 1941 and 1942

State	Rural Customers		Residential Customers		Commercial and Industrial		Municipal, Rail and Miscl.		Total Customers	
	1941	1942	1941	1942	1941	1942	1941	1942	1941	1942
Arizona	1,400	1,570	90,000	95,000	16,180	16,010	320	197	107,900	112,777
California	260,000	282,000	1,800,000	1,835,000	380,700	361,200	12,300	12,602	2,453,000	2,490,802
Colorado	12,500	15,700	209,000	216,500	45,800	40,300	900	922	268 200	277,422
Idaho	4,900	4,900	111,000	110,000	19,970	19,430	1,480	1,683	137,350	135,978
Montana	0	3	104,000	100,000	17,690	18,450	1,410	364	123,100	118,817
Nevada	0	0	25,100	26,500	5,250	5,283	50	47	30,400	31,830
New Mexico	0	8	51,300	59,500	11,750	12,600	250	240	63,300	72,348
Oregon	10,000	9,300	270,000	283,500	48,220	45,200	1,480	1,923	329,700	339,923
Utah	700	670	125,000	137,500	14,210	15,850	990	1,336	140,900	155,356
Washington	23,000	24,000	470,000	490,000	75,000	69,800	2,700	2,188	570,700	585,988
Wyoming	400	410	42,000	43,500	8,090	8,270	110	156	50,600	52,356
11Western States	312 900	338,561	3,297,400	3,397,000	642,860	616,423	21,990	21,503	4,275,150	4,373,597
United States	988,220	1,102,892	25,971,570	26,610,400	4,476,280	4,372,657	117,060	123,939	31,553,130	32,215,888

Source: Edison Electric Institute. 1942 estimate as of Dec. 31.

Table IV—Type and Capacity of Utility Generators, November, 1942

State	Companies*	Plants	Total Capacity Kw.	Generator Capacity in Kilowatts of Plant Operated by (a) — Water Power No.	Water Power Capacity	Steam Power No.	Steam Power Capacity	Internal Comb. Engines No.	Internal Comb. Engines Capacity
Arizona	23	57	620,938	15	458,290	14	116,427	28	46,221
California	36	160	2,813,104	116	1,558,445	29	1,204,850	15	49,809
Colorado	37	86	327,820	29	66,125	29	245,069	28	16,626
Idaho	19	59	269,950	45	266,100	2	650	12	3,200
Montana	13	31	336,319	18	321,235	5	12,218	8	2,866
Nevada	9	17	509 461	11	503,935	1	2,500	5	3,026
New Mexico	19	43	144,910	5	25,157	12	99,879	26	19,874
Oregon	32	81	692,008	52	496,452	19	190 250	10	5 306
Utah	26	74	168,364	57	91,830	3	66,250	14	10,284
Washington	31	69	1,357,050	48	1,137,605	14	217,420	7	2,025
Wyoming	28	45	86,306	14	49,690	15	32,017	16	4,599
11 Western States	273	722	7,326,230	410	4,974,864	143	2,187,530	169	163,836
United States	1,779	4,079	46,110,047	1,557	13,158,457	1,208	31,900,247	1,314	1,051,343

Source: Federal Power Commission.

(a) For combination plants each type of prime mover is counted as a separate plant.

*Includes duplications because of utilities operating in more than one state.

Table V—Distribution of Government War Contracts, June 1940-September 1942

All Figures Millions of Dollars

State	Grand Total	Army, Navy, Mar. Com. Treas. and Foreign (1)	Supply Contracts Aircraft (2)	Supply Contracts Ships (3)	Supply Contracts All other	Facilities Industrial (4)	Facilities All other (5)	Dept. Agr. and FHA (6)	WPA Defense Projects (7)	RFC Loan Commitments (8)	All Other (9)
Arizona	245	231	18	..	8	93	112	3	5	1	4
California	9,117	8,821	4,573	2,332	397	677	841	174	43	26	53
Colorado	452	433	..	..	132	135	166	3	12	1	5
Idaho	93	86	..	..	3	10	73	2	2	a	3
Montana	60	51	..	..	3	16	32	a	6	a	3
Nevada	114	105	..	..	..	86	19	5	i	a	3
New Mexico	91	83	..	..	a	3	80	1	4	a	4
Oregon	665	596	..	362	53	72	110	47	9	6	8
Utah	448	424	..	..	61	227	136	14	3	..	6
Washington	2,874	2,735	1,066	1,025	163	246	233	97	19	4	18
Wyoming	31	26	..	..	1	7	19	1	1	1	2
11 Western States	14,190	13,591	5,657	3,719	821	1,572	1,821	347	105	39	109
United States	104,948	101,036	25,365	15,215	36,504	14,274	9,677	1,572	657	1,047	636

Source: War Production Board and National Industrial Conference Board.

(1) Value of all major prime contracts reported to WPB by these agencies through September, 1942, excepting awards of less than $50,000 and all awards for foodstuffs. Data for the Treasury Department cover defense aid contracts of the procurement division awarded since March 5, 1942. Data for the British Empire and other foreign purchasing missions cover contracts awarded since September, 1939. Commitments by RFC and DPC for industrial facilities are included. Project orders to Army and Navy establishments of $11.1 billion are excluded.

(2) Includes engines. parts, parachutes, etc.

(3) Includes purchase of used ships, repair, etc. Armor, armament, navigation and radio equipment, parts and materials are excluded.

(4) Includes cost of land, construction, and equipment for industrial facility contracts placed by Army, Navy, Maritime Com., DPC, RFC and British.

(5) Camps, cantonments, etc.

(6) Defense Housing, including projects previously reported by FWA, USHA, PBA and FSA.

(7) July 1, 1940 to June 30, 1942.

(8) Loans for working capital and non-industrial facilities through August, 1942.

(9) Awards by CAA for airport expansion, Office of Education for defense training, and NYA allotments to Office of Administrator, WPA PBA, and PWA, for construction projects under Title II of Lanham Act.

(a) Less than $500,000.

"Huge strides have been taken during the past year in mobilizing production resources in the war effort. In the Twelfth District, most spectacular results have been achieved in aircraft fabrication and in shipbuilding. Late in the year, aircraft industry production was at an annual rate exceeding 2 billion dollars, more than double that of two years earlier. Deliveries of Liberty cargo vessels in November by Pacific Coast yards attained a rate of 540 ships per year. Industrial expansion has been accompanied by full employment, and labor shortages have developed in many areas. Under these conditions, trade has reached high levels, but the year closed with indications of important shortages of consumers' goods in many categories."—*Federal Reserve Bank Review.*

Impact of the war effort was felt in different degrees by different states here in the West. To a certain extent this is shown by the increased rates of power generation (see Table II). Maximum growth in power output was in Arizona. brought about by shifting loads on the machines in the Boulder power plant and by the initial operation of a new machine on the Arizona side of the plant. The Pacific Northwest with its new electro-metallurgical and electro-chemical plants upped generation in Washington by 28.9% and in Oregon 22.3% over 1941. The increase in California was 11.2%.

"The conversion phase unfolded. Manufacturers of women's unmentionables were making mosquito netting; a hair curler producer was making clamps for airplane assemblies; a roller coaster maker had converted to production of loading hooks and bomber repair platforms; toy trains to bomb fuses, watches to fire control equipment, typewriters to machine guns, tombstones to armor plate."—*OWI.*

Conversion of plant brought conversion of manpower, and especially in the case of the West, important population shifts. Since the 1940 census, it is estimated that Pacific Coast states have had an 11% increase in population, with the bulk of the new people coming in 1942. This is reflected in the figures on electrical customers reported in Table III. The 1942 gain of approximately 100,000 customers fails to reveal some of the important aspects of the situation. There has been a noteworthy decrease in small commercial customers. Furthermore many of the housing projects erected to care for the population influxes in the expanding industrial areas are served from one meter.

"It takes time to build a special purpose plant and get it into production. It takes time to ready a peacetime plant for production of war goods. The American people were impatient, and industry responded with one of the most remarkable achievements in history. Hundreds of plants came into production ahead of schedule and they produced faster than schedule."—*OWI.*

In places where the electrical industry did not have the power facilities needed for prosecution of the war effort, it soon made them ready. This was not necessary in the case of generating capacity. The foresighted planning of past years in anticipating future requirements resulted in the installation of 557,000 kw. of new generating capacity during 1942. Most of this was hydro power. In the steam category Pacific Gas and Electric Co. brought in a third oil refinery generating plant with 40,000 kw. installed, and it added some 31,000 kw. of hydro. However the principal contributors were the plants of governmental agencies. In the Northwest the Bonneville Power Administration had 271,000 kw. more capacity from the Bonneville and Grand Coulee stations. At such U. S. Reclamation Bureau plants as Boulder and Parker dams another 225,000 kw. of capacity began operating.

"Adding to the solidity of confidence in power adequacy in the years ahead is the already indicated trend toward a lessening of the rate of increase in demand for power. The job of building the national war production plant is approaching completion; the period of preparation for war production is coming to an end. This change in the industrial aspect of the war effort means that the demands for materials for the construction and equipment of munitions factories and of process plants, among which materials electric power must be included, will flatten off at more or less fixed levels."—*Electrical World.*

The increasing demands for war power here in the West will probably taper off in 1943, when new capacity totaling 150,000 kw. of steam and more than 675,000 kw. of hydro will begin generating. This huge total includes 40,000 kw. of steam for PG and E., 35,000 kw. for San Diego Gas & Electric, 65,000 kw. for the Los Angeles Bureau of Power & Light and 10,000 kw. for Burbank. The hydro involves 128,000 kw. in new stations for PG and E, another unit at Boulder Dam, more capacity at Parker Dam. 528,000 kw. at Bonneville and Grand Coulee and 36,000 kw. from Tacoma's Nisqually project. Present plans carry only into 1944. In that year Bonneville will get 162,000 kw. additional and the Reclamation Bureau will start two machines at Shasta Dam.

"Dire predictions of national power shortage have been based on estimates of power requirements derived from various ratios of electrical energy needed per dollar of war production or per wage-earner-hour. The statistical record confounds these predictions and discloses their source of error. They just did not take into sufficient account the two elements of ability of production capacity to work longer hours and of displacement of civilian by war production."—*Electrical World.*

Here in the West generators worked 16 days longer on the average in 1942 than they did in 1943. In the case of hydro generators the figure was double —32 days on the average. Based upon an analysis of Federal Power Commission figures made by *Electrical World,* in regions VII and VIII in the FPC compilations, comprising the states of California, Oregon, Washington, Idaho, Montana, Utah, Nevada and Arizona, the margins of dependable capacity over peak requirements have increased materially since December 1940. In that month, for the two regions, the margin was 21.8%. By December, 1941, it had dropped to 19.5%. However, by December, 1942, it had risen to 25.6%. Operation of power pools in both the Northwest and the Southwest have been eminently successful and have contributed to this result.

"In 1942 the United States transformed itself from the world's greatest producer of peacetime goods to a producer of the machines and equipment of war at a rate unequaled by any other nation. At the end of this year the United States was producing shooting equipment at a rate more than four times faster than in November 1941." —*OWI.*

A year ago in these columns attention was directed to the startling revolution in Western economy which had developed, as more and more war goods production was centered in the West. The extent of this revolution can be measured partially by the compilation in Table V, which shows the distribution of government war contracts since June 1940. The West has received 13.5% of all contracts awarded and in special categories, the proportion is even greater. In aircraft the percentage is 22.3 and in ships, 24.4. More than $1½ billions has been advanced by the DPC for new industrial facilities. In addition almost $250 has been invested by industrial organizations from their own funds.

These basic industrial facilities will be a potent factor in the postwar development which will follow victory.

"Electricity is power . . . power for production for Victory. But, more important, electricity is *time*—and minutes are bullets on the home front. Electricity speeds the wheels of industry . . . produces more food faster with less manpower . . . cuts time corners in a dozen ways in home and office. . . . The progress we have made in the last decade counts *NOW.*"—*Puget Sound Power & Light ad.*

Wartime conditions and wartime controls are dominating the economic and business picture of the electrical industry for the present. Peacetime policies have been abandoned and the new conditions have been accepted as essential to but one thing—winning the war. After that—well things will be different.

POWER GOES TO WAR

Wartime needs govern most construction programs—In 1942 Western utilities spent $73,000,000, Federal agencies another $74,000,000—1943 activities pared to meet only war demands

CERTAIN aspects of public utility engineering and construction have been changed materially by the war. The usual economics of planning new facilities has had to be tempered by the pressing necessity of obtaining the most power in the quickest time, with the least possible use of critical materials. In some instances this has dictated the rehabilitation of old plants at relatively high cost which, under normal circumstances, would not be warranted. Likewise it has become necessary at times to use types of material and equipment which experience has shown are not economical on a long-time basis. On the other hand, the emergency has encouraged a cleaning of shelves by the disposal of unused and obsolete equipment from warehouse stocks and the salvaging and re-use of valuable idle equipment and material. It has promoted more than the usual ingenuity in devising new methods of construction and design from which future favorable results may be expected.

Those few words by an engineer who prepared one of the following reports summarize the wartime construction activities of Western public utilities. Wartime necessities and realities have dictated construction programs for the past year and will continue to influence future construction, maintenance and operating procedures. Programs will be governed by the requirements of war industries and military and naval establishments.

Even so, 1942 was a year of near record expenditures. The 38 private and municipal systems whose reports are summarized on the following pages spent upwards of $73,000,000. Last year at this time they had budgeted $84,000,000 and it appeared as though priorities and allocations would limit actual expenditures to a fraction of that amount. However, much of the planned work was associated with the war effort. In addition the various federal agencies in the power field in the far West spent $74,000,000, making a total for the year of $147,000,000.

The year 1943 will see expenditures pared to a point commensurate solely with demands created by the war. The same 38 systems have budgeted $53,800,000 of construction work of this category. The various federal agencies will have large appropriations available, but actual expenditures will be governed chiefly by priority allocations. The U.S. Bureau of Reclamation has $128,000,000 in unexpended balances. REA has $11,600,000 of allocations to Western projects. The Bonneville Power Administration also has a considerable backlog of unexpended appropriations.

Study of the summarized programs on the following pages should lead to the conviction that electric power supply will not be a bottleneck which will hold up the war effort here in the West. The summaries have been provided through the generous cooperation of executives and officials of private and municipal systems and government agencies, for which the editors of ELECTRICAL WEST are grateful.

Work on the Pit No. 5 diversion dam of the Pacific Gas and Electric Co. proceeds on a 24-hour schedule. This 146,000-kw. power project is scheduled for completion in the early fall of 1943. It consists of diversion dam, 6-mile pressure tunnel, four penstocks and four generating units in the power house

Federal

Bureau of Reclamation

THE CONSTRUCTION program of the Bureau of Reclamation was greatly curtailed by the War Production Board in the fall of 1942 on projects considered non-essential to the war effort. Construction of some features, particularly those which will provide additional power in 1943 and 1944, was permitted to continue and current appropriations totaling approximately $128,000,000 are available for carrying forward this construction program during the fiscal year ending June 30, 1943. The sources and amounts of these funds are as follows:

Appropriations by the Congress from the Reclamation Fund	$11,000,000
Appropriations by the Congress from the General Treasury	117,000,000
Total	$128,000,000

The principal work proposed or accomplished during the fiscal year 1943 is briefly described for each project under the state head in which the work is located. A tabulation of USBR power development appears on page 65.—*S. O. Harper, chief engineer.*

Bonneville

DETAILED activities of the Bonneville Power Administration are reported on page 66. The Army Corps of Engineers report on the Bonneville power house is on page 67.

REA

RURAL ELECTRIFICATION, as measured by the addition of new farms to power lines or the construction of new lines in farming districts, came to a virtual stop in 1942. Construction was limited by scarcity of materials, restricted later to completion of undertakings well started by Dec. 7, and later halted completely.

Only about 14,000 farms were connected during the fiscal year to the lines of private utilities, REA-financed cooperatives and public power districts, before materials scarcities brought construction to a virtual standstill. This brought to only 63.4% the index of farms in the 11 Western states with central station electric service on June 30, 1942.

On the other hand, mobilization of rural electrification facilities to meet the demands of war became increasingly important. Farms made greater use of electricity to increase production of vital war foods and to alleviate the growing manpower shortage. More military establishments and rural war plants depended on REA systems and other rural lines for power.

Gross revenues of the REA systems in the 11 states West of the 100° meridian amounted to $2,988,913 in the fiscal year ended June 30, 1942, an increase of $1,004,263 over the preceding year.

A total of $39,080,548 had been allocated by REA to systems in these states, of which $11,617,477 was still available for use when materials again become available. The status of the REA systems appears on page 60.—*Information Section, REA.*

Reports appear alphabetically under states:

Arizona 55
California 56
Colorado 64
Idaho 66
Nevada 66
New Mexico 66
Oregon 66
Utah 69
Washington 70

Photo sources: p. 54, Pacific Gas and Electric Co.; p. 56, USBR; p. 57, Pacific Gas and Electric; p. 59, Los Angeles Bureau of Power & Light and USBR; p. 62, USBR; p. 63, Los Angeles Bureau of Power & Light; p. 69, USBR and Southern Colorado Power Co.

Arizona

Arizona Edison

MINOR additions to generating plants in 1942 required expenditures totaling $11,012, with no additions to capacity. Transmission expansion included 11 miles of line to serve new defense projects and 1½ miles to interconnect with an adjoining system so as to permit purchase of wholesale power. Additions to distribution facilities cost $57,329 during the last year with 1,650 kva. of transformer capacity added. Total electric construction amounted to $105,165.—*D. R. Hamilton, assistant treasurer.*

Arizona Power

TOTAL capital expenditures for the electric department for the 11 months ending November 1942 were $112,000. These expenditures were mainly for new transmission lines and associated substations.

A 9.15-mile, 44-kv., single-circuit, wooden pole transmission line, was built from the terminus of our existing Flagstaff Line to Bellemont, in order to supply the Navajo Ordnance Depot with electricity. A 5.44-mile extension was made to the Bellemont Line to supply construction power to the contractor engaged in the construction of the above depot.

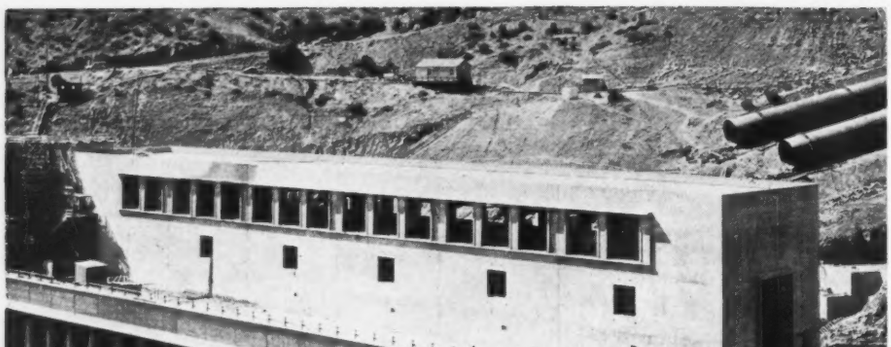
The municipal distribution system of the Town of Williams was connected to our 44-kv. Prescott-Ash Fork Line through the construction of a new 18-mile, single-circuit, wooden pole transmission line, and the overbuilding of 4½ miles of existing 11-kv. line with a 44-kv. circuit. A 450-kva., 44,000 to 2,300-volt substation was built in the Town of Williams.

Expenditures contemplated for 1943 are small and are primarily for necessary renewals and replacements to distribution lines.—*Malcolm Bridgwater, general superintendent.*

Central Arizona L. & P.

EXPENDITURES for additions to our electric property during 1942 amounted to approximately $313,000. Major items included 12-kv. and 66-kv. substation additions, $152,000; 66-kv. transmission line, $18,000; distribution lines and service, $3,000; distribution transformers, $32,000; electric metering, $26,500.

Our 1943 budget is estimated to be approximately $508,000, made up of the following: additional boiler and spray pond, $365,000; 66/4-kv. substation, $27,000; 2,400-volt capacitors, $13,000; distribution lines and services,



Shasta Dam power house will be completed by the middle of the year and work of installing two of the 75,000-kw. units will be well underway. Two Shasta machines are being installed at Grand Coulee at least for the duration

$48,000; distribution transformers, $20,000; electric metering, $15,000.

No new capacity was added in 1942 and the only work in this category scheduled for 1943 is a new boiler. Last year 17.11 miles of 66-kv. transmission line was built and 8.3 miles of 11-kv. re-insulated for 66 kv. Only 12.5 miles of new distribution was added.

One 4,500-kva., 66/12-kv. substation was erected and additions were made to the 12-kv. and 66-kv. switchyard at the steam plant to take care of connections to the Parker Dam line. Approximately 300 kva. of capacitors were installed on the 2,300-volt distribution system. System relaying was revamped during the year.

As little reconstruction, revamping and new construction as possible is being done so as to save critical materials, even at the expense of overloading equipment and allowing a much larger spread in the voltage regulation band. In fact no reconstruction will be done if it is possible to get by with existing equipment. Operating procedure has been modified in order to reduce car mileage and conform to our reduced personnel.—*L. K. Doutrick, chief engineer and vice-president.*

Salt River Valley Assn.

APPROXIMATELY $625,000 was expended during 1942 for new equipment. Out of this amount $360,000 was to complete the steam plant installation at Tempe. No new generating capacity was added during the year.

Expenditure for transmission plant totaled $142.000, mostly for installation of synchronous condensers to improve conditions on the existing system. No new lines were added. Only nominal increases were made to the distribution plant and the amount expended was $125,000.—*F. L. Roe, superintendent of power.*

Tucson G., E. L. & P.

NEW additions to our electric system in 1942 totaled $385,000, 60% of which represents expenditure for 50 miles of 45-kv. transmission line to Ft. Huachuca and the necessary rebuilding of some 15 miles of existing transmission line. The latter was changed from No. 4 to No. 00 copper to serve this new base load of 3,000 kw. Other defense loads added in 1942 were Ryan School of Aeronautics, Marana Air Base, and Consolidated Aircraft Corporation, all of which required extension of transmission lines and installation of new substation equipment.

Generating capacity has been increased with the completion of the Bureau of Reclamation's new 69-kv. line from Phoenix. This delivers 15.000 kv. of Parker Dam power to our system.

In 1943 no major expenditures for new and improved facilities are contemplated. Due to War Production Board's restrictions, even normal growth will probably be limited in scope.

Transmission increases noted above totaled 71 miles.

Distribution line additions were negligible. A total of 1,304 kva. of distribution transformers was added.

Substation transformers installed totaled 25,149 kva. A new substation of 3,000 kva. was erected at Ft. Huachuca; one of 1,500 kva. at Marana Air Base; and one of 1,000 kva. at Consolidated Aircraft. The existing substation of 750 kva. at Davis-Monthan Airbase was changed to 1,500 kva.—*M. A. Pooler, president and general manager.*

California

Burbank Public Service Dept.

CAPITAL outlay for 1942 was approximately $900,000 and the estimated figure for 1943, about $400,000. The second unit of our steam-electric generating plant was not completed in 1942 as first planned, but will be on the line in March, 1943, barring further delay. This unit, as the first, is a 10,000-kw., 80%-P.F., 3,600-rpm. Allis-Chalmers with 825°, 625-PSI, B & W boiler. Preliminary engineering on a third unit has been dropped because of the difficulties of priorities and deliveries.

While no changes have been made in our transmission lines, a great improvement is being made by the installation of a system of pilot wire relay protection. This work has been completed on three sections of the lines and work on the other two will be completed during 1943.

Another feeder has been run from the Burbank Station to serve a large defense plant. This feeder leaves the station underground through 1,550 ft. of 500,000 mc. 3 conductor, P.I.L.C. cable and then goes overhead for 4,000 ft. on 4/0 W.P. wire. The feeder is 3-phase, 4 wire, 4.3 kv. and is operating unregulated at present.

To supply a section of the city rapidly becoming industrialized, a new substation having an installed transformer capacity of 5.000 kva. has been built. This sub, 34.5 kv. to 4.3 kv., will bring power to this area which would otherwise require four additional 4.3-kv. feeders emanating from the already fully-loaded Burbank Station. The new substation went into operation in January, 1943.

System improvements have been limited to bare necessity for rendering service. Transformer loadings have greatly increased and minimum wire size employed, thus lowering voltage quality. A considerable amount of rebuilding and improvement is scheduled for the postwar period to reestablish the high standard of quality of service previously rendered.

Although the annual system peak demand showed very little increase over the previous year, energy consumption

increased 47%. At the present time, 75% of all energy sold goes directly to the war effort.—*J. H. McCambridge, general superintendent.*

California Electric Power

CONSTRUCTION expenditures in 1942 included $64,365 for generation. This was spent for the replacement of No. 1 generating unit at Bishop Creek plant No. 5 with a turbine unit from Leevining Creek No. 3.

Transmission expenditures totaled $240,433. Included was construction of 63.6 miles of 55-kv. wood-pole line using 1/0 stranded copper conductor for service to Basic Magnesium, Inc., in Nevada. Other items were re-insulation and re-conductoring of approximately 4 miles of 88-kv. line, including relocation of a portion of the line to clear a military reservation; re-poling of section of 55-kv. lines serving Nevada territory; and construction of a patrol road to facilitate operation and maintenance of sections of an 88-kv. line through an area otherwise difficult of access.

Distribution activities required $443,152. Miles of line already constructed or under construction included:

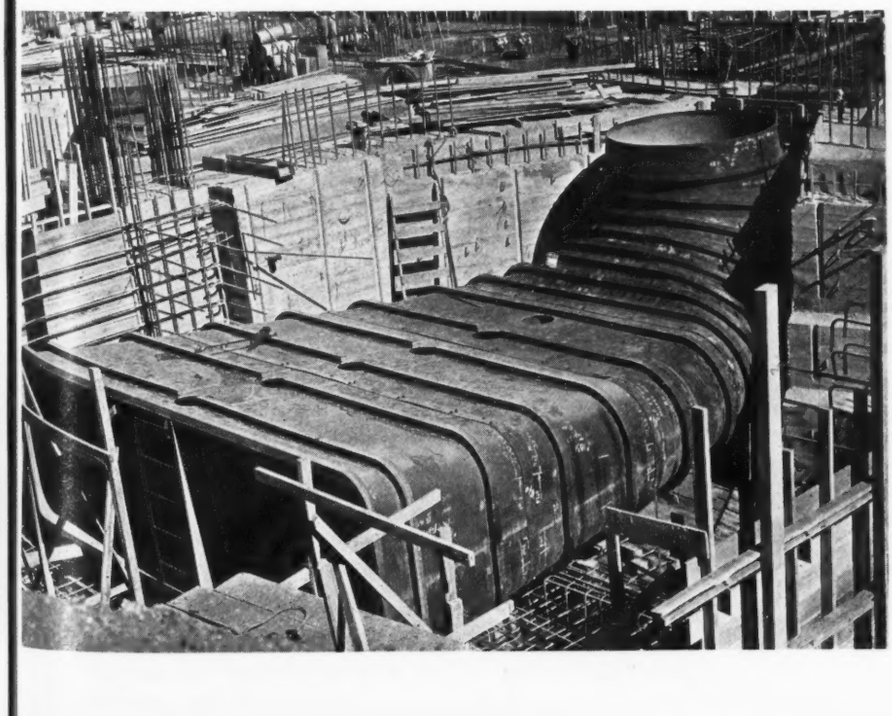
33-kv. line	21.3 miles
16.5-kv. line	1.7 miles
Lower voltage line	35.8 miles
Total	58.8 miles

The aforementioned amount for distribution facilities includes approximately $101,327 to cover specific service to military reservations or related war industries. The balance of the amount includes expenditures for new lines for customer service other than military, reconstruction and modernization of existing lines, including re-conductoring and re-insulation of short sections of the primary distribution lines.

Expenditures for substations and equipment totaled $641,192. New substations constructed totaled 15, with a combined capacity of 29,075 kva. Seven of the foregoing substations, totaling 13,500 kva., have subsequently been taken over by the U. S. Army or Navy under agreements whereby they become the property of the United States. Of the remaining 8 substations, totaling 15,575 kva., 2 serve military installations and 6 serve related military areas or war industries.

The addition of 26,625 kva. in transformer capacity at existing substations included the installation of 20,000 kva. at San Bernardino substation and rehabilitation of the 3,000-kva. substation for the Riverside Cement Co. at Oro Grande. Improvements in regulation included the installation of a 2,000-kva. synchronous condenser and 990 kva. in capacitors at the B.M.I. substation at Gabbs, Nev.; installation of a 3-phase regulating transformer at Gale substation, and installation of a step-voltage regulator at Coachella substation to replace the synchronous condenser moved to B.M.I. substation. Other miscellaneous substation improvements included the addition of automatic reclosing features to the Kramer substation oil circuit breaker; installation of a modern lightning arrester at Banning substation to replace an older installation; installation of low oil level alarm facilities on large transformers at generating plants and important transmission line substations, etc.

Draft tubes are shown below in course of installation at the Pit No. 5 plant of Pacific Gas and Electric Co. This project is scheduled for early completion



Other system improvements totaled $47,640. Principal expenditures under this heading included the erection or relocation of seven living quarters for operators or patrolmen; purchase of a heavy construction truck; purchase of five motorcycles and five "servi-car" units for meter reading and light service work.

Total authorizations for 1942 construction were $1,436,772.

Proposed 1943 construction expenditures cover the following:

Generation	$ 69,800
Transmission	274,200
Distribution	358,000
Substations and equipment	155,500
Other system improvements	126,000
Total	$983,500

The proposed expenditures for the year 1943 include the following principal items:

Construction of Gem Lake Tunnel at Rush Creek	$ 15,000
Replace portion of Mill Creek plant wood-stave pipeline	15 000
New generator breakers at San Bernardino steam plant	16,200
Rebuild generating equipment at Bishop Creek plant No. 3	9,000
Lightning protection for main transmission line	200,000
New switching station at Fish Lake Valley	12,300
Re-insulation, re-poling and re-conductoring of sections of transmission lines	41,100
Rebuild distribution lines in Tonopah, Nev.	11,500
Distribution lines — new lines, re-poling, re-conductoring and re-insulation, etc.	294,900
New substations totaling 6,500 kva	112,800
Automotive equipment (contingent upon ability to obtain)	86,800
Miscellaneous small items, all classes	168,900

Ability to secure materials or some unforeseen emergency conditions may modify this.—*R. H. Halpenny, chief engineer.*

Central Valley Project, USBR

CONSTRUCTION of Shasta Dam and Powerhouse will continue and by June 30, 1943, concrete placement in the dam should be about 90% complete, the powerhouse buildings completed, and the installation of units 3 and 4 should be 50% completed. Two of the generating units originally intended for the Shasta Power Plant were transferred and are being installed in the Grand Coulee Power Plant, Columbia Basin Project, by order of the War Production Board. Construction and installation of unit No. 5 was ordered stopped.

Shasta Reservoir clearing will continue and fish control works and relocation of railroads, highways, and public utilities will be completed. Construction of the Shasta switchyard and the Shasta-Oroville transmission line will be started before the end of the fiscal year. Work has been suspended on the Keswick Dam and Power Plant, Kennett Division, and the canal system on the Friant Division by order of the War Production Board. Friant Dam, with the exception of spillway gates and outlet valves, was completed during the first part of the fiscal year. The 1943 appropriation is $39,000,000.

Glendale PS Dept.

THERE was no new generating capacity added but we had on order in 1942 a second 20,000-kw. steam-electric generating unit and one additional boiler, together with all of the auxiliary equipment. However, priorities were cancelled and consequently this project is deferred until conditions will permit us to proceed. No extension or betterment to the transmission system was made.

We added approximately 3 miles of 4-kv. extension to war industry plants and completed some small rearrangement of our primary distribution system representing completion of some work under progress from the prior year. We installed two regulators, one on the new circuit mentioned above and the other was a delayed shipment received for construction under way in the prior year. I believe that our coming year will see no improvements made and our biggest problem will be in procuring sufficient personnel for operation.—*P. Diederich, superintendent.*

Imperial Irrigation District

THE PRINCIPAL expansions of the district's power system during 1942, consisted of those extensions made to serve the Navy and Marine bases which were built throughout the valley. Due to the WPB freezing order, only a small amount of distribution extension was made.

The 34-kv. transmission line was extended from Niland to Camp Dunlap, a distance of 5 miles; and a 1,000-kva. bank with automatic step-voltage regulator and oil circuit breaker was installed to serve the main camp.

The capacity of the Westmorland rural substation was increased from 300 to 600 kva. and the 12.5 kv. was extended approximately 9 miles to serve the seaplane base on the Salton Sea. Due to the expansion of the facilities at El Centro Airport, the district found it necessary to increase the capacity of its Seeley Substation from 300 to 1,000 kva. and to install larger oil circuit breakers and metering equipment.

About 12 miles of distribution line were built during the year, to serve such important loads as dry ice plants, radio beacons and street lighting, where such were of importance to war work and national defense.

No generating or transmission line capacity additions are planned for 1943 except that of tying in with the USBR at Hydro Plant No. 4 thereby making Parker Dam power available to the district. An extension of a rural line out of Holtville will also be made to serve the airport which is to be built on the East Mesa.—*E. H. Aiken, operating engineer.*

Los Angeles Bureau of P. & L.

CONSTRUCTION expenditures for extensions and new and improved facilities during 1942 amounted to approximately $11,520,000. The major items covered by this expenditure included Receiving Station "D" and the new Harbor Steam Plant, as well as numerous extensions to the distribution facilities to supply war industries. The 1943 program, of course, will be limited by priority negotiations to the minimum essential additions and betterments necessary for system operation and the completion of those projects now in an advanced stage of construction. The expenditures probably will not exceed $4,500,000.

During 1942 generating facilities at Boulder Power Plant were increased by 82,500 kw. with the completion of Unit A-2 allotted to this city. A unit of the same capacity which had been leased from the Metropolitan Water District during the previous year was returned to that organization.

Construction of the Harbor Steam Plant, with the first unit scheduled for December of 1942, was somewhat delayed due to the war demand upon electric manufacturers and the difficulty in obtaining the necessary critical materials for the completion of this project. At the close of this year the steam generating facilities were ready for dry-out preparatory to operation; all major equipment was installed and the plant should be ready for a test run early in 1943. This will be in sufficient time, with the decreased load demands resulting from daylight saving, dimout regulations, and other load curtailments, to meet the increased demands of industries now being served from the Bureau of Power and Light system and still guarantee sufficient reserves to meet normal emergencies.

The 132-kv. underground cable section of the transmission line between Receiving Stations "E" and "D" has been completed and is now ready for operation. The overhead portion, of double-circuit, steel-tower construction, has progressed and also should be ready for operation in February of 1943. This will permit energizing of Receiving Station "D", located in the West Los Angeles area. This station will allow transferring to this "D" system, numerous distribution stations which formerly were served from Receiving Stations "A" and "B". This will materially relieve the overload conditions existing at Receiving Stations "A" and "B", improve voltage conditions in the West Los Angeles area, and allow for a better utilization of the three Boulder transmission circuits by more evenly distributing the load among these circuits. The major portion of the 34.5-kv. cable and pole line construction necessary for supplying the distribution stations served from this new system has been completed or will have been completed before the station is ready for energizing.

An additional transmission project which received final approval from the War Production Board only 48 calendar days before its required completion date was the 6.2-mile, double-circuit transmission line connecting the new aluminum reduction plant with Receiving Station "C". This line, because of imposed restrictions, was constructed using 300,000 circ. mil copper rather than the 500,000 circ. mil, which is standard practice for lines of this capacity in the Bureau of Power and Light system. Additional load of plants now being constructed in the same area, required additional carrying capacity; and both circuits of this 132-kv. line have been increased by the addition of 3/0 and 4/0 copper salvaged from other sections of the bureau distribution system.

Receiving Station "D" has been ready for operation for some months; but due to priority difficulties in obtaining the necessary materials for high voltage supply and 34.5-kv. distribution connections, the station will not be in operation until February 1943. This station is of the same general type as Receiving Stations "B", "C", and "E", now in operation as part of the city's main transmission line terminal supplying its belt line. The major portion of the equipment used in this station is of standard construction, having been purchased and partially delivered before restrictions were imposed due to the present war effort. The present capacity of the station is 150,000 kva.

Construction of distribution facilities also was limited, primarily, to those necessary for the supplying of war industries and other customers associated with the war activity. Even with the limitations of normal expansion the 34.5-kv. overhead lines were increased by 8.5 circuit miles, while the underground cable facilities were increased 5.4 circuit miles. Overhead low voltage circuits including primaries, secondaries, and line extensions, amounted to 66 miles of circuit while the underground low voltage system, in the same classification, was increased 34.4 miles. The additions to the overhead system amounted to just slightly more than 50% of the previous year's construction, while the underground cable additions were less than 30% of that for the previous year.

Ten additional miles of conduit facilities were added during the past year to cover all classes of underground

service, and 99 man-holes were constructed. Of these, 83 were for 34.5-kv. and lower voltage service, many of which are of the vault type housing underground transformers supplying major consumers.

The increased war load demands resulted in serious overloading of transformer facilities, as well as requiring the installation of numerous new transforming equipment to meet these growing demands. Approximately 500 transformers were added to the low voltage distribution system, totaling in excess of 19,000 kva., while 52 industrial stations were added to the 34.5-kv. system, with a total capacity of approximately 30,000 kva.

The total additions to the transmission facilities included the 5 miles of 132-kv. underground cable connecting Receiving Stations "D" and "E", the 2.4 miles of underground cable between Harbor Steam Plant and Receiving Station "C", the 6.2 miles of double circuit overhead line between Receiving Station "C" and Aluminum Reduction Plant, and the 7 miles of double circuit overhead transmission system completing the circuit between Receiving Stations "D" and "E." This latter item was still under construction at the close of the year.

The communication facilities required further additions and 9½ miles of combination pilot wire and communication cable were installed to meet these increased demands. A short wave frequency modulated radio station was added to the communication system for the dispatching of patrol and emergency service cars with two-way communication available from selected cars operating in strategic areas. Some increases and transfer in personnel were made in order to handle the necessary plant protection program as recommended by the federal agencies. Considerable construction was necessary in order properly to protect electric facilities on the Bureau of Power and Light system against possible sabotage and air attack, and minor additions to this protection will be added during the coming year.

The electric energy produced for the Bureau of Power and Light system during 1942 was 2,381 million kwh., an increase of 16.2% over the previous year. Present estimates indicate that the year 1943 will require over 3¾ million kwh. to be produced by the Bureau of Power and Light system to meet the increased war load demands, which will be a total increase of 83% over 1941.—*H. C. Gardett, chief electrical engineer and general manager.*

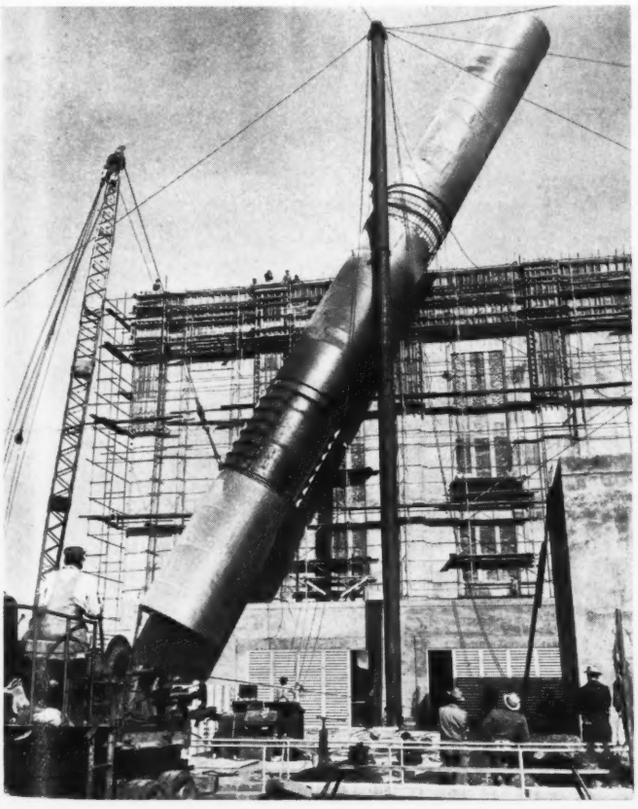
Pacific Gas and Electric

DUE to the necessity of subordinating every activity to the one main objective of winning the war, construction plans of this company have been changed in some respects from the program described in the report submitted last year and expenditures were reduced somewhat below the amount budgeted. Nevertheless, although material shortages have occasioned delays, the company has completed the most essential parts of the program and has made available adequate electric power to supply both war and civilian demands with a reasonable margin of reserve. Expenditures for new and improved facilities during the year amounted approximately to $30,000,000. For 1943 similar expenditures are expected to aggregate about $21,400,000.

1942 Program

Generation—The principal change from the program described in last year's report was deferment of the 75,000-kva. Midway Steam Plant at Buttonwillow.

The 50,000-kva. No. 1 unit at Oleum Steam Plant was connected into the system on Jan. 15, and after final testing and adjustment, was in full opera-



Stack weighing 35 tons is shown being raised at the Harbor plant of the Los Angeles Bureau of Power & Light. The stack will rest on the low building in the foreground so as to provide stability against earthquake shock and to save steel

At Grand Coulee power house a 350-ton crane is about ready to move the stator and thrust bearing bracket of a 75,000-kw. Shasta generator from its erection base to one of turbine pits in background. Two units are being erected

tion in March. The 11,000-kva. hydro plant at Upper Narrows on the Yuba River was completed and placed in service the latter part of December. The generating capacity added by these two units will be further augmented by an additional 27,500-kva. to be available from the Dutch Flat Hydro Plant which will be completed early in 1943. All of these facilities have been described in previous reports.

Steam Plants Rehabilitated

In the interest of conserving critical materials needed for vital uses in the war effort, and in order to utilize possible sources of power that could be made available in a minimum of time, authority was obtained from the War Production Board to rehabilitate two of the older steam plants. The first of these, known as Station "W," Oakland, which had been abandoned was re-connected into the system in December and yields approximately 7,000 kw. of peak capacity. The second, the Bakersfield Steam Plant, by provision of a new atmospheric cooling tower and reconstruction of the cooling water and fuel supply system, together with minor maintenance work, will be able to carry 25,000 kw. of load on a dependable basis.

Another possible source of extra peaking capacity is being obtained by reconstruction of the forebay for Hat Creek No. 2 Hydro Plant in the Pit River region, where additional storage now being provided will yield approximately 6,000 kw. of peak. This project was expected to be completed about the end of January.

Construction of the Pit No. 5 project was prosecuted actively throughout the year. Of the total length of 28.000 ft. of tunnel, 7,500 ft. remained to be excavated as of Dec. 31, 1942. Concreting of the tunnel lining is now under way. The concrete diversion dam was well on schedule with approximately 23,000 cu. yd. of the total of 26.600 cu. yd. poured. Two of the four 50-ft. wheeled crest gates have been installed and the structure is now sufficiently advanced that the temporary diversion can be abandoned when high water makes this necessary. More than one-third of the power house concrete has been poured, bringing the structure above the danger point of winter floods. Two of the four penstocks have been completely fabricated and their installation will commence within the next few weeks. It is expected that the entire plant will be in operation before the end of 1943, bringing an additional 160.000 kva. of capacity into the system.

Transmission—The current year's additions to transmission lines, 60 kv. and above, have been confined entirely to such extensions of and ties to existing circuits as were required to supply war loads, plus the circuits needed to deliver energy from the new hydroelectric and steam electric projects to load centers.

In the latter category two 110-kv. circuits were completed from Oleum Steam Plant to a tie with the Claremont-Newark lines and one circuit of like voltage from Dutch Flat Power Plant to Vaca-Dixon Substation. Completed extensions to war industries include a twin circuit 110-kv. line, a single circuit, 110-kv. line, and about 100 miles of 60-kv. ties and extensions in various parts of the system. The total length of new transmission circuit added was approximately 270 miles.

New lines now under construction, and which will be finished in 1943, include a 110-kv. circuit between Oleum and Martinez steam plants and a double circuit, 220-kv. tap line from Pit No. 5 Power House to a junction with the existing 220-kv. Pit-Vaca transmission line at Round Mountain. The rerouting of 110-kv. and 60-kv. circuits in the vicinity of Shasta reservoir at an eleva-

Western REA Systems

System	Borrower's Name	Cumulative Allotments Dec. 31, 1942	1942 Allotment	Consumers Connected 11/30/42
ARIZONA	**State Total**	**$ 953,000**	**$ 0**	**1,212**
2 S. E.	Stonewall Electric Co., Tucson	100,000	0	226 (a)
4 Pinal	San Carlos Irrigation & Drainage Dist., Coolidge	145,000	0	291
14 Cochise	Sulphur Springs Valley Electric Coop., Inc., Willcox	708,000	0	695 (a)
CALIFORNIA	**State Total**	**$2,069,500**	**$ 18,000**	**4,015**
1 Imperial	Imperial Irrigation Dist., Imperial	700,000	0	1,800 (a)
6 Modoc	Surprise Valley Electrification Corp., Alturas	798,500	0	987 (a)
16 Plumas	Plumas-Sierra Rural Elec. Coop., Portola	392,000	0	734
18 San Diego	Mountain Empire Elec. Coop., Inc., Campo	154,000	18,000	494
24 Bard D. P.*	Bard Laguna Elec. Coop., Inc., Bard	25,000	0	0
COLORADO	**State Total**	**$9,157,000**	**$1,024,000**	**11,927**
7 Mesa	Grand Valley Rural Power Lines, Inc., Grand Junction	430,500	0	985
14 Alamosa	San Luis Valley Rural Elec. Coop., Inc., Monte Vista	597,500	0	971
15 Morgan	Morgan County Rural Elec. Assn., Fort Morgan	845,000	0	1,191
16 Jefferson	Intermountain Rural Elec. Assn., Littleton	441,000	50,000	494
17 Prowers	Southeast Colorado Power Assn., La Junta	792,500	35,000	1,526
18 Gunnison	Gunnison County Electric Assn., Inc., Crested Butte	338,000	10,000	403
20 Delta	Delta-Montrose Rural Power Lines Assn., Delta	588,000	0	1,132
21 S. E.	Stonewall Electric Co., Trinidad	39,000	0	146
22 Boulder	Union Rural Elec. Assn., Inc., Brighton	405,000	0	1,003
25 Pueblo	San Isabel Elec. Assn., Inc., Pueblo	129,000	10 000	205
26 San Miguel	San Miguel Power Assn., Inc., Nucla	248,000	74,000	460
29 Phillips	Highline Electric Assn., Holyoke	1,378,500 A	125,000	754
31 Larimer	Poudre Valley Rural Elec. Assn., Inc., Severance	596,000	5,000	1,335
32 La Plata	La Plata Electric Assn., Inc., Durango	286,000	125,000	553
33 Dolores	Empire Electric Assn., Inc., Dove Creek	338,000	0	268
34 Eagle	Holy Cross Electric Assn., Inc., Basalt	299,000	0	255
35 Chaffee	Sangre De Cristo Elec. Assn., Inc., Salida	160,000	0	28 (a)
36 Routt	Yampa Valley Elec. Assn. Inc., Steamboat Springs	185,000	10,000	246
37 Douglas*	Mountain View Elec. Assn. Inc., Colorado Springs	1,061,000	580,000	0
IDAHO	**State Total**	**$4,049,750**	**$302,000**	**6,259**
4 Bonner (b)	Northern Idaho Rural Elec. Rehabilitation Assn., Inc., Sandpoint	890,750	0	1,093
10 Nez Perce	Clearwater Valley Light & Power Assn., Inc., Lewiston	1,468,000	76,000	2,430
11 Kootenai	Kootenai Rural Electrification Assn., Inc., Coeur d'Alene	316,000	32,000	675
14 Valley	Long Valley Power Coop., Donnelly	346,000	189,000	253
15 Idaho	Idaho County Light & Power Coop. Assn., Inc., Grangeville	339,000	0	498
16 Cassia	Raft River Rural Elec., Coop., Inc., Malta	116,000	0	250
17 Fremont	Fall River Rural Elec. Coop., Inc., Ashton	364,000	0	690
19 Butte	Lost River Electric Coop., Inc., Arco	109,000	0	218
21 Camas	Prairie Power Coop., Inc., Fairfield	101,000	5,000	152
MONTANA	**State Total**	**$3,700,598**	**$150,000**	**6,987**
1 Ravalli	Ravalli County Electric Coop., Inc., Corvallis	202,800	15,000	437
2 Cascade	Sun River Elec., Coop., Inc., Fairfield	482,500	0	1,132
5 Richland	Lower Yellowstone Rural Electrification Assn., Inc., Sidney	176,600	0	505
9 Yellowstone	Yellowstone Valley Electric Coop., Inc., Huntley	383,498	0	1,182
10 Madison	Vigilante Electric Coop., Inc., Trout Creek	495,000	5,000	605
12 Missoula	Missoula Electric Coop., Inc., Missoula	257,000	0	417
13 Flathead	Flathead Electric Coop., Inc., Kalispell	253,700	0	524
15 Fergus	Fergus Electric Coop., Inc., Lewistown	386,000	0	542
16 Park	Park Electric Coop., Inc., Livingston	238,000	0	268
17 Rosebud	Mid-Yellowstone Electric Coop., Inc., Hysham	191,500	3,000	374
19 Stillwater	Beartooth Electric Coop., Inc., Absarokee	294,000	0	550
21 Big Horn	Big Horn County Elec. Coop., Inc., Lodge Grass	213 000	0	451
24 Blaine*	Big Flat Electric Coop., Inc., Turner	45,000	45,000	0
25 Sheridan*	Sheridan County Elec. Coop., Inc., Westby	37,000	37,000	0
26 Valley*	Northern Electric Coop., Inc., Opheim	45,000	45,000	0
NEVADA	**State Total**	**$. 254,000**	**$ 0**	**421**
3 Alamo D. P.*	Alamo Power Dist. No. 3, Alamo	27,000	0	0
4 Overton	Overton Power Dist No. 5, Overton	227,000	0	421
NEW MEXICO	**State Total**	**$1,449,000**	**$ 0**	**2,352**
4 Eddy	Central Valley Electric Coop., Inc., Artesia	345,000	0	402
8 Roosevelt	Roosevelt County Electric Coop., Inc., Portales	302.000	0	573
9 Curry	Farmers' Electric Coop., Inc., Clovis	264,000	0	643
12 Otero	Otero County Electric Coop., Inc., Cloudcraft	145,000	0	300
13 Stonewall Electric	Stonewall Electric Co., Albuquerque	216,000	0	434
14 Mora*	Mora-San Miguel Elec. Coop., Inc., Mora	177,000	0	0
OREGON	**State Total**	**$4,834,500**	**$160,000**	**6,166**
2 Lane	Blachly-Lane County Coop. Assn., Blachly	282,000	0	339
4 Lincoln	Benton-Lincoln Elec. Coop. Assn., Corvallis	1,040,000	0	1,150

System	Borrower's Name	Cumulative Allotments Dec. 31, 1942	1942 Allotment	Consumers Connected 11/30/42
5 Clatsop	Nehalem Valley Coop. Elec. Assn., Jewell	119,000	20,000	254
14 Umatilla	Umatilla Elec. Coop. Assn., Hermiston	298,000	20,000	757
16 Malheur	Malheur Coop. Elec. Assn., Vale	312,000	40,000	426 (a)
17 Douglas (c)	West Douglas Elec. Coop., Inc., Roseburg	820,000	0	1,213
18 Eugene	Lane Co. Elec. Coop., Inc., Eugene	710,000	60,000	18 (a)
19 Jordan Valley	Jordan Valley Electric Coop., Inc., Jordan Valley	30,000	0	83
21 Coos	Coos Electric Coop., Inc., Coquille	460,500	0	822 (a)
22 Clackamas	Northeast Clackamas County Electric Coop., Inc., Sandy	91,000	20,000	192
25 Deschutes	Central Electric Coop., Inc., Redmond	327,000	0	585
26 Wasco	Wasco Electric Coop., Inc., The Dalles	345,000	0	327
UTAH	**State Total**	**$1,314,000**	**$ 2,000**	**2,176**
6 Garfield (d)	Garkane Power Assn., Inc., Hatch	594,000	0	1,057 (a)
8 Duchesne	Moon Lake Electric Assn., Inc., Mt. Emmons, Utah	708,000	0	1,093
9 Beaver	Beaver Valley Elec. Assn., Inc., Beaver City, Utah	12,000	2,000	26 (a)
WASHINGTON	**State Total**	**$7,705,419**	**$120,719**	**11,200**
8 Benton	Benton Rural Elec. Assn., Prosser	386,500	40,000	939
9 San Juan	Orcas Power & Light Co., Eastsound	476,000	0	656
14 King	Mutual Power & Light Assn. of Tanner, North Bend	22,919	719	35 (a)
17 Klickitat	Public Utility Dist. No. 1 of Klickitat County, Goldendale	550,000	0	243
18 Spokane	Inland Empire Rural Elec., Inc., Spokane	2,030,000	0	3,211
20 Columbia	Columbia Co. Rural Elec. Assn., Inc., Dayton	319,000	10,000	302
23 Grays Harbor	Quinault Light Co., Quinault	79,000	0	151
25 Cowlitz	Pub. Utility Dist. No. 1 of Cowlitz County, Longview	221,000	0	655
27 Lewis	Public Utility Dist. No. 1, Chehalis	416,500	0	1,334
28 Kittitas	Public Utility Dist. No. 1 of Kittitas County, Ellensburg	161,000	10,000	330
30 Stevens	Stevens Co. Elec. Coop., Inc., Colville	620,000	24,000	772
31 Chelan	Chelan Co. Elec. Coop., Inc., Leavenworth	68,000	6,000	93 (a)
32 Okanogan	Okanogan Co. Elec. Coop., Inc., Winthrop	178,500	10,000	318
35 Pend Oreille	Pend Oreille Electric Coop., Inc., Newport	334,000	0	419
36 Adams	Big Bend Elec. Coop., Inc., Ritzville	432,000	0	311
37 Lincoln	Lincoln Elec. Coop., Inc., Davenport	628,000	20,000	568
38 Douglas*	Douglas Co. Elec. Coop., Inc., Waterville	75,000	0	0
39 Nespelem	Nespelem Valley Elec. Coop., Inc., Nespelem	108,000	0	295
45 Grant D. P.	Public Utility Dist. No. 2 of Grant Co., Ephrata	600,000	0	568
WYOMING	**State Total**	**$3,659,500**	**$284,000**	**4,352**
3 Fremont	Riverton Valley Elec. Assn., Inc., Riverton	261,000	0	526
5 Big Horn	Big Horn Rural Elec. Co., Basin	411,000	0	743
6 Goshen	Wyrulec Co., Lingle	417,000	174,000	698
9 Uinta	Bridger Valley Elec. Assn., Inc., Mountain View	181,000	0	345
10 Platte	Wheatland Rural Elec. Assn., Wheatland	80,000	0	206
11 Lincoln	Lower Valley Power & Light, Inc., Freedom	454,000	0	749
12 Park	Garland Light & Power Co., Powell	199,300	0	180
13 Washakie	Washakie Rural Electric Co., Worland	56,500	0	153
14 Laramie	Rural Electric Co., Pine Bluffs	1,009,000 B	0	576
16 Hot Springs*	Hot Springs County Rural Elec. Assn., Thermopolis	98,000	10,000	0
17 S. E.	Stonewall Electric Co., Sheridan	78,700	0	126 (a)
21 Carbon	Carbon Power & Light Co., Saratoga	314,000	0	50 (a)
23 Shoshone*	Shoshone River Power Inc., Cody	100,000	100,000	0

* Not Energized.
(a) Estimated.
(b) A Consolidation of Idaho 4 and 6 and Montana 11.
(c) A Consolidation of Oregon 17 and Oregon 28.
(d) A Consolidation of Utah 6 and Utah 7.
A—$488,000 of this amount represents line construction in the State of Nebraska.
B—$22,500 of this amount represents line construction in the State of Colorado; $555,500 of this amount represents line construction in the State of Nebraska.

REA Generating Plants†

System	Location of Plant	Kw. Capacity	Type	Status
Arizona 14 Cochise	Near McNeal, Cochise County	1,425	Nat. Gas Diesel	Operating
Calif. 6 Modoc	Near Alturas, Modoc County	772	Diesel	Operating
*Colo. 18 Gunnison	Crested Butte, Gunnison County	500	Hydro	
*Idaho 4 Bonner	Outlet of Priest Lake, Bonner Co.	1,000	Hydro	
Oregon 2 Lane	Blachly, Lane County	150	Hydro	Operating
Utah 6 Garfield	Hatch, Garfield County	200	Diesel	Operating
*Utah 6 Garfield	Hatch, Garfield County	500	Hydro	
Utah 8 Duchesne	Near Mt. Emmons, Duchesne County.	900	Hydro	Operating
Wash. 9 San Juan	San Juan, Orcas Island, S. J. County	250	Diesel	Operating
Wash. 23 Gray's Harbor	Quinault, Gray's Harbor County	250	Hydro	Operating
Wyoming 9 Uinta	Lyman, Uinta County	224	Nat. Gas Diesel	Operating
Wyoming 11 Lincoln	Near Freedom, Lincoln County	600	Hydro	Operating

† There are in addition 7 mobile units operating in the states covered by this report. Five of these mobile units are of 100 kw. and two are of 120 kw. capacity.
* Construction stopped for the duration.

tion above the flood level is also under way. Some sections of these lines involve unusually heavy construction because of the necessity of long spans across arms of the reservoir.

A relatively large number of substation changes were required to reinforce various parts of the transmission system, principal among which were increases in transformer capacity at Golden Gate Substation in El Cerrito, at Shasta Substation in the vicinity of Redding, and at Station "J," Oakland; and construction of Sausalito Substation.

A total of 116,350 kva. of substation transformer capacity was added to the system during the year.

Distribution—The program for additions and betterments to the company's distribution facilities during 1942 was dictated almost solely by the demands of military depots, bases and cantonments, war industries and defense housing. The electric service required to supply such loads required the installation of some 420 miles of new distribution circuit and numerous additions to distribution substation capacity in various parts of the company system.

Under the necessity of conserving critical materials, considerable effort was devoted to the maximum utilization of existing distribution facilities. This took form in the addition of blowers and forced oil cooling to self-cooled transformers to increase their rated capacities, improvement of voltage conditions by the use of capacitors, the development of designs in wood to replace steel structures in distribution substations, salvaging, reconditioning of idle copper and reinsulation of idle copper from abandoned circuits and the relocation of equipment in some instances to more strategic points where its full capacity could be utilized to better effect.

Continuing the practice described in last year's report in relieving overloaded territories, five additional factory-built unit substations were installed, each of 2,000-kva. capacity. This makes a total of 21 stations of this type now operating in the company's territory, 18 of which are situated within a radius of 50 miles of San Francisco. As an emergency facility in the event of a transformer failure in any of these unit substations a 2,500-kva. trailer type mobile substation was purchased. While this mobile equipment is expected to serve primarily as a spare for the unit substation, it can also be effective in supplying many of the industrial establishments in the Bay Area in the event of the failure of other apparatus installed there, or in servicing temporarily a new load for which other apparatus may not immediately be available.

The necessity of justifying each new distribution facility from the standpoint of its importance in the war effort and the insistence by the WPB of conserving every possible pound of copper, steel, and other critical materials dictated a very close scrutiny of all projects and the exercise of more than the usual ingenuity in many cases.

1943 Program

Generation—Generating plant construction during 1943 will be devoted chiefly to the continuation of projects already under way, no additional facilities being planned at this time.

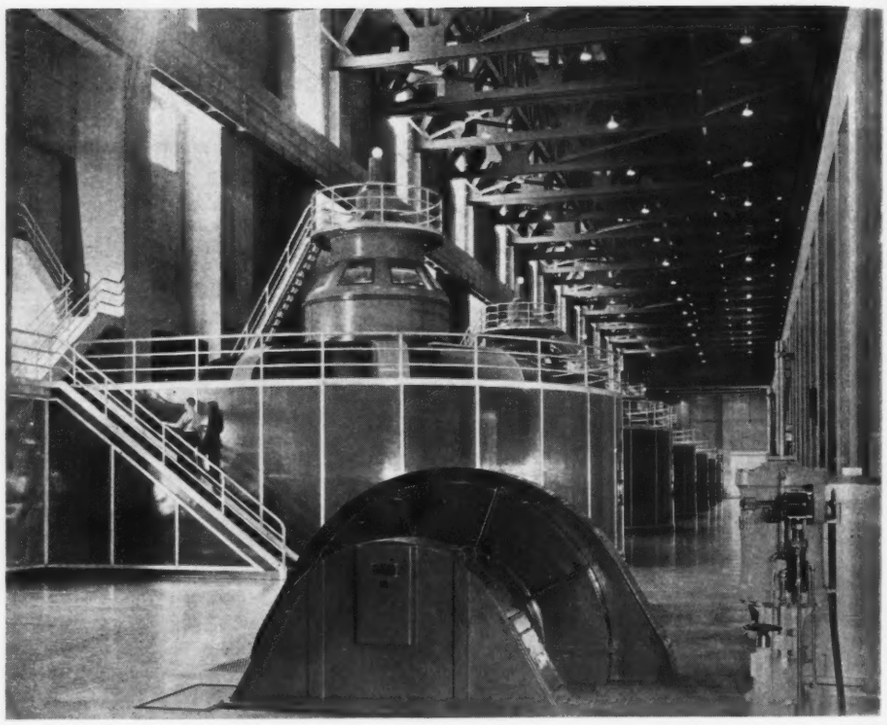
The completion of Dutch Flat Plant, not later than April, will be followed by Oleum No. 2 Steam Plant by July or earlier, and this, in turn, by the Pit No. 5 project whose four units are expected to be brought in at progressive intervals during the latter half of the year. Additions during 1943 from the three plants mentioned will total 237,500 kva. This will be further augmented about March 1 by the 6,000 kw. of additional dry year peak capacity from the reconstructed Hat Creek reservoir and in March by the 25,000 kw. to

become available from the reconstructed Bakersfield Steam Plant.

Transmission—The most important item of transmission construction scheduled for 1943 consists of the lines and substation additions necessary to absorb Pit 5 power. The plan finally adopted requires a minimum of extensions to our present circuits with a view to effecting the greatest possible saving in total copper and steel requirements. The 14-mile tap from Pit 5 Power House to a junction with the present Pit-Vaca lines at Round Mountain, previously mentioned as under construction, represents the only addition required to our existing 220-kv. lines. This tap consists of two circuits each on separate, wood H-frame towers except for a few special steel towers where required by the topography.

The output of Pit 5 will be divided between the two existing Pit-Vaca 220-kv. circuits as far as Vaca Substation. From Vaca to Contra Costa, the present single circuit is already constructed for 220-kv. operation but currently operating at 110 kv. Because of an outlet for a portion of the Pit power at Vaca via Cordelia Substation to Marin County, it will be possible to transmit the balance of this Pit power to Contra Costa merely by increasing the voltage on the existing circuit to 220 kv. An additional 90,000 kva. of transformer capacity will be installed at Contra Costa and changes made in the switching equipment, providing a tie to the 220-kv. system from Martinez, Avon and Oleum steam plants over the two existing 110-kv. circuits to Contra Costa. Voltage stabilization at Contra Costa will be provided by taking advantage of the reactive capacity of the Avon and Martinez generators. From Contra Costa the Pit power will be transmitted over existing lines to Newark Substation where 120,000 kva. of transformer capacity will be added, together with two 35,000-kva. synchronous condensers and necessary switching and control equipment. Minor changes in the 220-kv. switches at Vaca-Dixon and in the switching equipment at Mocho Junction substations will also be required. Substantially all of this work is expected to be completed during 1943.

In order to supplement energy being provided by the City of San Francisco to the central California aluminum reduction plant and to improve voltage regulation, a capacitor station will be constructed at this location during the first half of 1943 consisting of 25,200-kva. of static capacitors with necessary related switchgear and other accessories. Due to the increase in load on Golden Gate Substation at El Cerrito, it is also proposed during 1943 to install fans to increase the capacity of the 100/12-kv. transformer bank from 45,000 to 60,000 kva.



An 82,500-kw. generator was installed in this U. S. Reclamation Bureau Western hydroelectric plant in 1942 and a similar unit is to be added in 1943, bringing the total capacity to more than 1,000,000kw.

Distribution—The extent of distribution construction during the coming year is almost wholly dependent upon the programmed expansion in industrial plants and other projects related to the war effort, which cannot be accurately predicted. It is expected that the situation will closely parallel 1942 additions. Several new 12-kv. circuits are already under construction and others have been authorized to supply the increasing load in the San Francisco Bay area, and substantial additions to substation capacity are contemplated.

The aggregate effect on PG and E system of the war program coupled with the dislocation of normal civilian activities has been to retard the rate of growth in commercial and domestic sales and to reduce moderately the system lighting load, as contrasted with an unprecedented increase in the demand for industrial power. The system annual load factor has been improved. Commercial and industrial consumers now utilize 63% of the total electric energy sold by the company.

Palo Alto

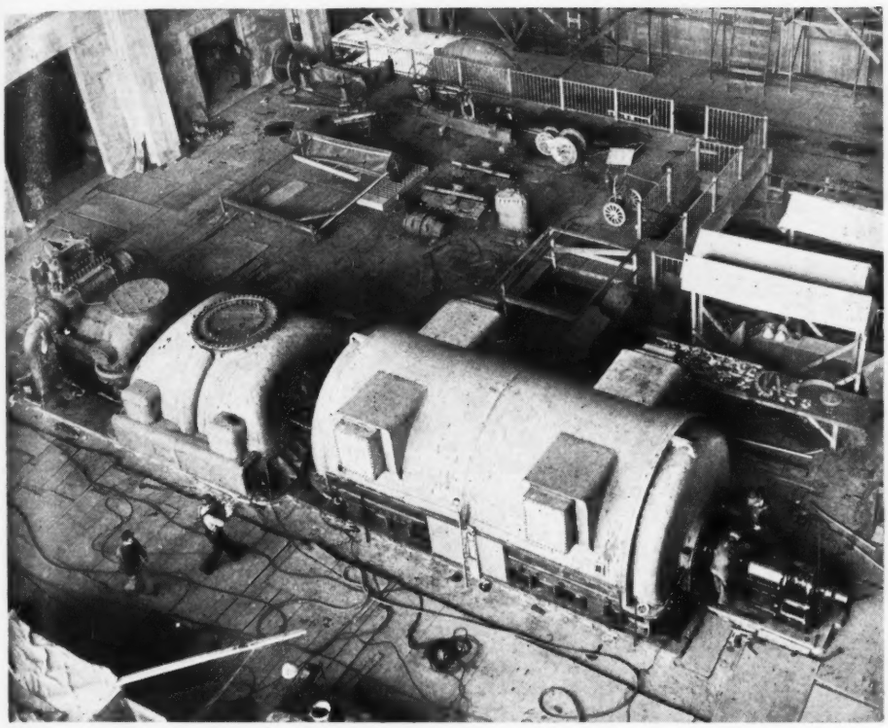
DURING last year $22,575 was expended for distribution, the principal items being—poles and fixtures $5,000, transformers $3,700, services $3,300, and meters $5,000. Some $11,700 was budgeted for similar distribution construction for the 1942-1943 fiscal year but conditions of the times will have upset the plans. Replacement of old unfit poles will probably make up the major expenditure.

Additional pole type shunt capacitors have been added as a means of improving power factor.

Palo Alto is principally a residential community, there being comparatively little industrial load. The blackout and dimout restrictions have caused about 17% reduction in the average monthly peak load (lighting) and 8% less kilowatt-hour consumption for first five months of 1942-1943 fiscal year as compared to same period of 1941-1942.—*A. V. Youens, electrical engineer.*

Parker Dam, USBR

THREE of the four 30,000-kva. generating units in the Parker Power Plant were placed in commercial operation in December 1942, and the fourth unit will be in operation in the spring of 1943. Two 20,000-kva. synchronous condensers were placed in operation at the Phoenix substation in December 1942. This substation is the terminus of the Parker Dam-Phoenix transmission line. The Phoenix substation, together with substations at Tucson, Coolidge, and Blaisdell, Arizona, and at Drop No. 4 Power Plant of the Imperial Irrigation District system in California, will be completed and in operation early in 1943. All transmission lines scheduled for construction on the Parker Dam power project will be completed early in 1943. The current appropriation is $4,818,000.



This is how the 65,000-kw. turbo-generator being installed by the Los Angeles Bureau of Power & Light appears from the crane runway during erection. Quick load pickup is a feature of this machine

Riverside Electric Dept.

DURING the past year the distribution lines of the department were increased to 216.86 miles with an addition of 1.42 mi. of line; total expenditures for extensions and reconstruction amounting to $71,855. The department changed over the connections for two Type C 364-kva., 3-phase, 50-cycle, 500 amp. induction regulators by paralleling the stator windings, thereby increasing the capacity of these regulators to 1,000 amp., however reducing the range to 5% buck or boost regulation.

The department has installed in the major portion of the business district a remote control circuit whereby the merchants may obtain the services of the department without charge for the turning off of window and other night lighting in the event of a blackout.

Additional capacitors were installed of 600-kva. capacity, of the substation indoor type for further power factor correction. Power purchases during 1942 totaled 35,590,412 kwh.—*L. W. Grayson, superintendent.*

San Diego Gas & Electric

DURING the year the San Diego Gas & Electric Co. continued its program of expansion in order to provide the necessary facilities for the naval and military stations, and the war industries in the territory served. Capital expenditures for new and improved facilities in 1942 totaled $4,480,000. The budget for 1943 contemplates the expenditure of $1,810.000.

All efforts were made during the past year to complete the company's new Silver Gate steam-electric generating station, the first unit being a 35,000-kw. machine. However, due to delays in the delivery of several essential items, the unit will not go into service until early in 1943.

Only 4.2 miles of new transmission lines were constructed during the year. Twenty-three miles of a 115-kv. transmission line were rebuilt to bypass a new artillery range. There were extensive additions to the company's 12-kv. feeder system, which involved placing in service a new 25,000 kva. substation at Old Town, and a 50,000-kva. substation alongside the Silver Gate generating station. These stations serve to complete a new loop surrounding the City of San Diego, and tying together the company's two generating stations with the Mission Valley Substation, at which power from the Southern California Edison Co. is delivered.

Other additions and improvements were made to a number of substations, especially those serving military encampments. war industries, and new housing projects. Eighty miles of distribution lines were constructed.

A new 12-kv. interconnection was installed to Tijuana in order that a portion of the Mexican load of the Border Telephone and Light Co. might be carried by the San Diego system.

During the year 5,500 kva. of capacitors were added to the system, bringing the total installed to 25,000 kva.

In this, the first year of war, the company surmounted the serious problems which affected all utilities operating in a zone of operations, such as the erection of protective revetments, and the setting up of a complete guard system. There were likewise modifications of lighting installations, and compliance with dimout regulations. These problems, together with those of furnishing service to a greatly increased population, were taken care of in the face of priority restrictions, labor shortages, and transportation difficulties.—*L. M. Klauber, vice-president and general manager.*

Southern California Edison

THE past year has been another busy year and we have spent approximately $5,000,000 for new and improved facilities. Our construction budget for 1943 is approximately $6,500,000.

In the middle of 1942 it became evident that the A-5 generator at Boulder would not be ready for service until the latter part of the year. Arrangements were made with the Los Angeles Bureau of Power and Light and the Metropolitan Water District for the temporary use of an 82,500-kw. generator at Boulder on the Edison system. This generator operated for the last three months of the year on the Edison system and effected a saving of approximately 100,000 bbl. of fuel oil at our steam plants. Work on the third 82,500-kw. generator for Edison use at the Boulder Power Plant was completed in December and this unit is now in commercial service. This unit was designed for operation at either 50 or 60 cycles and tests conducted indicate that it can satisfactorily carry full load at either frequency.

In further carrying out the work being done on the water-wheels at Big Creek, so as to get the maximum capacity and efficiency when operating at 60 cycles, as well as 50 cycles, a new runner was installed in one of the units at Big Creek No. 3 in the spring of 1942. With this new runner kilowatt capacity and efficiency at 60 cycles was increased until it is now possible to get the same number of kilowatts out of this machine at 50 cycles and 60 cycles as was formerly obtained at 50 cycles only.

A new 220-kv. transmission type bus was installed at Big Creek No. 3, which in effect makes this a three bus station. This greatly increases the flexibility and reliability of operation of the Big Creek plants and associated transmission lines, when operating simultaneously at both 50 and 60 cycles.

The Chino-Laguna Bell 220-kv. line was put in service the early part of 1942. This completes the two 220-kv. circuits from Boulder into the major 220-kv. system so that these lines can take the full output of three machines at Boulder. No other major additions were made to the transmission system. Approximately 50 miles of distribution lines were constructed in 1942 and 22,000 new consumers were added to the system. Most of the business taken on was on existing lines and a large per cent of the new customers are war industries and their employees.

During the year 75,000 kva. of transformer capacity was added to the major 220-kv. system, 95,000 kva. of transformer capacity was added to the 66-kv. system; practically all of it supplying war industries. Some 25,000 kva. of transformer capacity was added to the distribution substations in and adjacent to the industrial areas.

Due to the change to war time in the early part of the year and the dimout regulations, our winter peak load was approximately 80,000 kw. under the estimate. This is nearly equivalent to the output of one of the main generators at Boulder Power Plant. Due to the above causes and the increase of off-peak load the system annual load factor increased from 59% in 1941 to 67% in 1942.

Considerable work has been done at Long Beach Steam Plant to provide quick pick-up with our oil-fired boilers. New oil burners have been developed so as to operate with minimum fire on oil for rolling reserve at the steam plant, at the same time maintaining the quick pick-up characteristics. Burners on one group of boilers have been installed and this work will be carried on in 1943. Telemetering equipment has been installed between the Bureau of Power and Light and the Edison systems so as to determine the load interchange during parallel operation.

Kaiser steel plant, the first plant on the Coast producing pig iron from ore, started operation in December with a connected load of 20,000 kw., which is expected to be doubled in 1943.

There has been considerable activity on the general system in the shifting of transformers from stations, which under wartime load conditions have excess capacity, to other stations in the industrial areas where the load has been rapidly increasing. This has enabled us to make better use of existing facilities and save considerable quantities of critical materials. Typical of this was the installation of 15,000 kw. of capacity at a war industries plant. The transformers supplying a synchronous condenser having the correct voltage taps were removed and installed on the industrial job. An old bank of water-cooled transformers, which had been out of service for a number of years (located at the Redondo Steam Plant, which was abandoned several years ago) was converted to natural cooled, outdoor and installed to supply the condenser.

Plans for 1943

The work which was started a few years ago to increase the capacity and efficiency of the hydraulic equipment in the Big Creek plants when operating at 60 cycles, is being continued in 1943. After the good results obtained with the new runner at Big Creek No. 3, two additional runners were ordered for this plant and are expected to be ready for installation before the summer peak load. Two new runners were also ordered for Big Creek No. 8 and are now on hand and will be installed within the next few weeks. This, with the work previously done, will make it possible to operate any or all of the generating units of the Big Creek system at either 50 or 60 cycles at practically the same capacity and efficiency. These changes materially increase the kw. capacity at 60 cycles over what it was before this work was undertaken.

It is planned to add 75,000 kva. of transformer capacity to the major 220-kv. system transforming to 66 kv. Approximately 50,000 kva. of transformer capacity will be added to the 66-kv. system and 15,000 kva. of distributing substation capacity to the 16-11-kv. distribution system. The two latter items are primarily to take care of increase in war production loads.

A new 85,000-kw. steam turbo generator is being added to Long Beach Steam Plant No. 2 to replace two units of the same total capacity taken by the U. S. government for lend-lease purposes.

Use of existing equipment will increase in 1943, particularly the relocation of transformers rather than the purchase and installation of new equipment.

All these changes, together with the increase in system load factor which is occurring, help to make more efficient use of existing facilities and reduce to a minimum the amount of new critical material required.—*N. B. Hinson, chief engineer.*

Turlock Irrigation District

VERY LITTLE new construction was undertaken during 1942 due to wartime restrictions, a war material manufacturing plant and an Army camp being the only principal additions served. Total new lines built amounted to about 3 miles on the 11-kv. system; none on the transmission system.

Improvements on the distribution system consisted of the installation of several banks of shunt-type capacitors and a step-type voltage regulator.

At the generating plants the main work undertaken besides routine overhaul and repair was the installation of new fire fighting systems.—*L. H. Parker, electrical engineer.*

Colorado

Colorado-Big Thompson, USBR

WITH the exception of the Green Mountain Dam and Power Plant all construction work on this project was halted by order of the War Production Board. The Green Mountain Dam and Power Plant, except for the radial gates for the spillway, will be completed early in 1943, and generation of power is scheduled to begin in May 1943. The current appropriation is $5,553,000.

Colorado Springs

IN 1942 we spent about $256,000 on capital improvements; $165,000 of this went for plant additions, replacing a 30,000-lb. boiler with a 100,000-lb. boiler and doing preliminary work for the addition of a 5,000-kw. turbine which will now be deferred for the duration.

Eight miles of double circuit 13.8-kv. transmission line and two 2,500-kva. substations were built for $53,000 to supply Camp Carson. Other expenditures of about $38,000 were made in 1942, mostly for ordinary growth of the distribution system.

For 1943 $50,000 is budgeted for additional forebay capacity at the hydro plant, $50,000 for additional water cooling equipment at the steam plant and $20,000 for ordinary additions, mostly distribution system.

Our gross generation in November 1942 was 56.2% greater than November 1941, and that without any additional capacity, so our efforts for the duration will be confined primarily to keeping the equipment we have in operation.—*F. H. Wiley, superintendent, electric division.*

Public Service of Colorado

OVER 85% of the $1,025,000 spent by the electric department of this company for new construction in 1942 was invested in transmission and distribution facilities, in contrast to predominantly heavy outlays for generating plant equipment in the preceding year. The company was fortunate in having completed its major capacity expansion program just prior to our

entry into the war, and it is anticipated that future capital outlays within the duration will be devoted almost entirely to reinforcing transmission outlets and delivering existing capacity to new war industries. About 65% of the budgeted $1,070,000 in 1943 will be used for transmission and distribution purposes.

pleted in 1942. This equipment serves one of the heavy apartment load areas of Denver, and its construction has permitted the rearrangement and improved loading of several of the 13-kv. and 4/2.3-kv. truck feeders in the city. This substation is equipped for automatic voltage regulation on the 4-kv. bus.

Two branch lines, each 2½ miles long, were built off of our 66-kv. line between Pueblo and Rocky Ford. One of these branches was to supply a 1,500-kva. substation installed at the Pueblo Air Base. The other extension was to supply a substation containing two banks of three 333-kva. transformers at

Current and Future Power Development on Bureau of Reclamation Projects

Name of Project	State	River	Purpose (1)	Name of Plant	Year Initial Operation	Initial Capacity Kw.	Initial Capacity No. of Units	Ultimate Capacity Kw.	Ultimate Capacity No. of Units
Boise	Idaho	So. Fork Boise	F.C., Irr., P.	Anderson Ranch	(2)	27,000	2(3)	40 500	3(4)
Boulder Canyon	Ariz.-Nevada	Colorado	F.C., Irr., P.	Boulder	1936	(5)952,300	14(6)	1,322,300	19(7)
Central Valley	California	Sacramento	F.C., Irr., P.	Shasta	1944	154,000	4(8)	379,000	7(9)
Central Valley	California	Sacramento	F.C., Irr., P.	Keswick	(2)	75,000	3(10)	75,000	3(10)
Colorado-Big Thompson	Colorado	Blue	Irr., P.	Green Mountain	1943	21,600	2(11)	21,600	2(11)
Colorado-Big Thompson	Colorado	Big Thompson	Irr., P.	1, 1A, 2, 3, 4, and 4A	(2)	(2)	(2)	160 000	(12)
Columbia Basin	Washington	Columbia	F.C., Irr., P.	Grand Coulee	1941	(5)344,000	5(13)	1,974,000	21(14)
Davis Dam	Ariz.-Nevada	Colorado	F.C., Irr., P.	Davis	(2)	180,000	4(15)	225,000	5(16)
Parker Dam	Ariz.-Calif.	Colorado	Irr., P.	Parker	1942	(5) 90,000	3(17)	120,000	4(18)

(1) F.C. = Flood Control; Irr. = Irrigation; P. = Power
(2) Construction stopped for period of war. Initial operation date indefinite.
(3) 2 — 13,500 kw.
(4) 3 — 13,500 kw.
(5) As of January 1, 1943.
(6) 11 — 82,500 kw.; 1 — 40,000 kw.; 2 — 2,400 kw.
(7) 15 — 82,500 kw.; 2 — 40,000 kw.; 2 — 2,400 kw.
(8) 2 — 75,000 kw.;; 2 — 2,000 kw.
(9) 5 — 75,000 kw.;; 2 — 2,000 kw.
(10) 3 — 25,000 kw.
(11) 2 — 10,800 kw.
(12) 6 plants
(13) 3 — 108,000 kw.; 2 — 10,000 kw.
(14) 18 — 108,000 kw.; 3 — 10,000 kw.
(15) 4 — 45 000 kw.
(16) 5 — 45,000 kw.
(17) 3 — 30,000 kw.
(18) 4 — 30,000 kw.

Generating Facilities—Growth of the company's annual peak demand during 1942 has not been as great as was anticipated during the early part of the year, and the 25.000-kv. unit added at Valmont Plant in December, 1941, has provided a comfortable margin of reserve capacity this winter. Completion of war department projects in the area during 1943, however, will absorb this reserve, and it is proposed to release an additional 10,000 kw. of capacity by the rebuild of the oldest of the company's large turbo-generators. In addition, it is anticipated that some 20.000 kw. of new hydro capacity will be made available to the system through purchase from the Green Mountain plant of the United States Bureau of Reclamation, scheduled for completion in the early summer.

Transmission—During 1942, construction of a new 30-mile, 110-kv., wood-pole H-frame transmission line was begun, which, upon completion in the spring of 1943, will extend from the Valmont Steam Plant to Denver and to a new high voltage substation being constructed by the Army Engineers. This line will constitute the fourth circuit connecting the company's major steam plant to its principal load center, and will reinforce the system to keep pace with its growing demands.

Distribution—Twenty-five miles of new distribution line were constructed in 1942, and only 20 miles are anticipated for 1943. Expansion of the distribution system for non-defense purposes will, of course, be negligible for the duration due to material shortages.

Substations—Capitol Hill Substation, with a rating of 6,000 kva., was completed in 1942. This equipment serves one of the heavy apartment load areas of Denver, and its construction has permitted the rearrangement and improved loading of several of the 13-kv. and 4/2.3-kv. truck feeders in the city. This substation is equipped for automatic voltage regulation on the 4-kv. bus.

A new 20,000-kva., 110/13-kv., 3-phase, transformer is being installed at the Denver North Substation, and a 2,-250-kva., 13-kv., 3-phase, regulating transformer has been received for installation at the Denver Terminal Substation on the Denver-Shoshone line. This latter apparatus will greatly improve operating conditions on the transmission line which will carry the power received by the system from the Green Mountain Plant of the USBR.

The first low-voltage Petersen coil application on the system will be made at 13 kv. in Denver during 1943.

Economic Trends—Completion of several major war loads in the area served by this company has industrialized the system's former domestic-agricultural load curve, and, because the hydro capacity of the region is typically peak-hitting in character, has greatly increased the load factor on our steam plants. There appears to be a material loss of commercial lighting load in prospect for the near future due to the closing of many small business enterprises, and it is believed that the 1943 peak load will probably be the maximum in this region for the war's duration.—*Guy W. Faller, president and general manager.*

Southern Colorado Power

NO GENERATING capacity was added during 1942. The only plant improvement consisted of placing an order for one 90,000-c.f.m., forced-draft fan for our Canon City steam power plant. Due to priority difficulties only the turbine drive for this unit has been received. The fan delivery has been postponed to September, 1943.

Two branch lines, each 2½ miles long, were built off of our 66-kv. line between Pueblo and Rocky Ford. One of these branches was to supply a 1,500-kva. substation installed at the Pueblo Air Base. The other extension was to supply a substation containing two banks of three 333-kva. transformers at an ordnance depot.

One additional 2,300-volt, three-phase distribution line was run from the Pueblo steam plant to the center of the city, a distance of approximately 2 miles. This circuit is controlled by a steel-clad, factory-assembled switching unit. In addition to the two substations mentioned in the foregoing, one 1,000-kva. unit-substation with built-in voltage regulators was ordered and has been delayed on account of priorities. This substation is to be installed in a section of Pueblo which has grown very rapidly on account of Federal Housing projects. Other system improvements were planned for 1942, but had to be abandoned on account of priorities, as shown by the reduction in our 1942 budget, which had authorization at the beginning of the period of $342,896 and only $167,017 assigned up to the first of December.—*M. G. Lord, vice-president in charge of operation.*

Trinidad E.T., R. & G.

DURING 1942 $27,000 was expended for new and improved facilities. The amount budgeted for similar work in 1943 is $15,000. Improvements and expansions consisted of 5½ miles of 22-kv. transmission line with a capacity of 750 kva. to serve an enemy alien internment camp. A 300-kva. outdoor type distribution substation constructed of wood was erected to serve this load, with provisions for an ultimate capacity of 750 kva. Other improvements consisted of the construction of anti-sabotage walls around transformer banks in outdoor substations.—*Paul M. Brown, electrical superintendent.*

Idaho

Boise-Anderson Ranch, USBR

WITH the exception of precautionary measures to protect as far as possible the work already done, all construction work on this project was stopped by the War Production Board for the war period. Funds available are $3,145,000.

Idaho Power

PRINCIPAL work in connection with generating facilities last year was reconstruction work on two dams. No new capacity was added. Two small 44-kv. transmission lines were built to serve facilities related to the war—a 6-mile line to serve a 1,500-kva. load and a 3.75-mile line to serve 2.250 kva. About 25 miles of 7,200- and 2.400-volt distribution line were built.

Considerable transformer capacity was added to existing substations, the total being 13,550 kva. in blocks ranging from 500 to 3,750 kva. Two new substations were built with capacities of 1,000 and 2,000 kva. respectively.

Other system improvements included the equipping of approximately 90% of all 11-kv. rural lines with spill gaps for lightning protection. Coordinated fusing was installed on three of the longer 11-kv. lines and two voltage regulators were added. Electrolytic lightning arresters were replaced with modern dry type arresters on three 44-kv. and two 66-kv. lines. Operating procedure was changed by placing responsibility for operation and maintenance of transmission lines and substations on the four operating divisions.

Estimated expenditures for 1942 totaled $720,600 divided as follows: generation, $46,700; transmission (including substation equipment), $157,900; distribution, $501,000; all other, $15,000. Probable 1943 construction budget totals $536,600 also divided as follows: generation, $83,400; transmission, $142,700; distribution, $305.000; all other, $5,500.—*Henry L. Senger, chief engineer.*

Nevada

Boulder Project, USBR

GENERATING unit A-2 was placed in commercial operation for service to the City of Los Angeles July 1942, and unit A-5 was placed in service in December 1942, making a total of eleven 82,500-kva. and one 40,000-kva. units in operation, in addition to two 3,000-kva. station service units. Installation of unit N-7 to supply power for the magnesium plant near Las Vegas, Nevada, will be well under way this fiscal year, but it is not expected that installation will be completed until the latter part of the fiscal year 1944.

Grouting of dam abutment and foundations will be continued and construction of retaining walls or extensions to tunnels and the tunnel outlet portals together with the channel improvements below the dam will be provided. Additional housing facilities and water supply equipment were provided and electric service was extended in Boulder City to care for an Army cantonment and a large influx of war workers employed in the territory adjacent to Boulder Dam. A hospital is included in planned improvements for Boulder City. Total Funds available are $10,000,000.

Davis Dam, USBR

ALL WORK was halted on this project by order of the War Production Board. The 1943 appropriation was $7,664,000.

Sierra Pacific Power

EXPENDITURES for new construction and replacements in the electric department totaled about $230,000 for 1942. Preliminary estimate for 1943 is approximately $60,000.

Improvements at hydro stations in 1942 included installation of a Burkey electric fish screen, booster transformers in the high side of step-up bank at one station and replacement of step-up transformers at another. Approximately 120 miles of distribution lines were built. A total of 585 kva. of capacitors was installed in the distribution systems. One new substation of 1,000-kva. capacity was installed at an Army air base.

Plans for 1942 include installation of one 240-hp. diesel generating unit, replacement of several 60-kv. lightning arresters and one substation transformer bank at same capacity. Distribution line construction probably will be of negligible amount. A new building for equipment storage is contemplated.—*V. D. Armstrong, engineer.*

New Mexico

Albuquerque G. and E.

DURING the last year this company experienced a growth in output of about 10% over the preceding year, although the number of customers only increased about 6½% due to restrictions in extensions under WPB Order P-46. Capital expenditures for the year amounted to $75,000. Contemplated expenditures for 1943 are approximately $60,000.

No new generating equipment or additional boiler capacity was added in 1942, all plans for any such additions being turned down for the time being, due, of course, to war conditions. No transmission lines or substations were built in 1942 and distribution extensions were materially reduced.

The only definite extension plans for 1943 involve a 4 mile 44-kv. line extension and 600-kva. substation to serve an Army airfield and a 300-kva. substation on our 22-kv. lines to serve a war manufacturing project.—*Arthur Prager, president.*

Oregon

Bonneville Power Administration

DUE to the availability of the backbone transmission lines built by the Bonneville Power Administration throughout Washington and Oregon, and to the fact that generation could be quickly added to the existing powerhouses at Bonneville and Grand Coulee, it has been possible during 1942 to construct in the Pacific Northwest many electrometallurgical plants using very large blocks of power. The construction carried on by the Bonneville Administration during the past year has consisted mainly in the completion and strengthening of the transmission backbone, and the construction of facilities for these plants.

This program is expected to continue during 1943, though at a somewhat reduced rate, due to the completion of the major transmission lines and the shortage of material required for additional construction. New generation made available to the system during the year 1942 included one additional unit 54,000 kw. installed by the U. S. Engineers at Bonneville powerhouse, and two additional units of 108,000 kw. each installed by the Bureau of Reclamation at Grand Coulee. Construction work now under way and to be completed in 1943, or very early in 1944, will add four more 54,000-kw. units at Bonneville and three more 108,000-kw. units at Grand Coulee. This is in addition to two 75,000-kw. units originally purchased for the Shasta project, which are now being installed temporarily at Grand Coulee powerhouse and which will be ready for operation early in 1943.

Transmission Lines—Among the major transmission lines completed in 1942 are the second 230-kv. circuit between Bonneville and Grand Coulee generating plants, and the 230-kv. line

between Grand Coulee and Covington. The first of these increases the transmission capacity between Coulee and the Portland area, and the latter provides the first direct outlet for Coulee power in the Puget Sound area, by means of inter-ties at Covington with the Cities of Seattle and Tacoma, and the Puget Sound Power & Light Co.; and through a 115-kv. line serving Tacoma.

Circuits have also been built, and additional circuits are under construction for expanding service in the Spokane area. Two lines are of 115-kv. wood pole construction and were completed and put in operation during the year. A double circuit, 230-kv. line is now nearing completion.

In the Portland area a double circuit 115-kv. line from Bonneville to the Portland-Vancouver area is nearing completion, although to date authority has been received for the stringing of one circuit only. In addition, an existing 230-kv. line in southern Washington was looped across the Columbia River to serve customers in Oregon. A number of lower voltage lines have been built in the area during the year to serve the all-important shipbuilding and electrometallurgical industries.

Construction falls short of the plans originally projected, since construction of many circuits (totaling 993.3 circuit miles) was deferred as a result of the material shortage.

Nevertheless, a total of 1,001.5 circuit miles of high voltage transmission lines have been energized or placed under construction during the year. In the same period, the sub-transmission system has been extended by 171.1 circuit miles to serve a number of important loads. The entire Bonneville Power Administration system now comprises a total of 2.399.0 circuit miles of 230-kv. and 115-kv. lines, and 381.3 circuit miles of sub-transmission lines.

Substations—The largest of the new Bonneville substations is located a few miles north of an eastern Washington city and designed to serve two loads of 195,000 kw. and 50,000 kw. and, indirectly, via another substation, a third large customer. This station will be the largest on the system.

At the end of the year the transformer capacity installed at this substation was 75.000/100,000 kva., supplied by two self-cooled air-blast transformer banks, 115 kv. to 13 kv. Construction is now under way on an extension to this station which will be completed early in 1943 and will provide for four 230-kv. banks. One bank of the first three will be equipped with 110-kv. auto-transformer taps in the high voltage windings for interconnecting the 230-kv. and 110-kv. busses. This bank has a rating of 150,000/100,000/75,000 kva. at 230 kv., 115 kv. and 13 kv., respectively.

The other three banks were originally ordered for the Shasta project and delivered by order of the WPB. Originally designed for water cooling, it was found possible to change them to forced oil cooling, eliminating the copper cooling coils and increasing the rating from the original 75,000 kva. to 100,000 kva. without change in size of core and coils.

Two synchronous condensers of 35,000 kva. each, and one of 30,000 kva. (diverted from another substation) will also be installed.

Major substations put in service during 1942 include also one in western Washington with one 75,000/100,000 SCAB bank. This station is to be doubled in size in 1943 by addition of a second bank.

Another bank of this same size was added at the J. D. Ross Substation, in the Portland area.

A new 75,000-kva. substation was built in the Puget Sound region to serve an aluminum reduction plant, and another of 150,000 kva. in western Oregon, for service to another new aluminum plant.

A new substation (37,500 kva.) in north central Washington serves an industrial customer.

An extension to an established substation in Oregon supplies two industrial customers.

Another shipyard in the Portland area is served by a separate 12.000-kva. substation.

A 70,000-kva. substation in eastern Washington has recently been put in service, with one 37,500-kva. bank, a second similar bank to be added early in 1943.

Bonneville Dam, U. S. Army

THE powerhouse building for the final installation was completed during 1942. Units 1 to 6 inclusive are now in production and work on the installation of Units 7 and 8 is now under way at Bonneville. Unit 7 will be ready for service about April 1, 1943 and Unit 8 three months later.

Work on Units 9 and 10 and the necessary auxiliary equipment is now under way in the shops of the contractors, and it is expected that the entire installation of 10 units will be in operation before the end of 1943.

California Oregon Power

EXCEPT for the possible rebuilding of a small hydro station with a consequent increase of 2,000 kw. in capacity, there will be no major generating facilities added to the system in 1943. None were added in 1942. Last year 22.8 miles of new transmission line were constructed and 5.25 miles rebuilt. During the coming year about 34 miles will be rebuilt.

Distribution construction in 1942 included the erection of 20 miles of new line and the re-conductoring of an additional 20 miles. Some 140 miles of distribution lines were sold to the North Douglas REA. Only minor additions are scheduled for 1943, with the likelihood that about 35 miles may be rebuilt and modernized. Last year 7,500 kva. of transformer capacity were added to substations along with 250 kva. of regulators and capacitors. About 16,000 kva. of new transformer capacity may be added in 1943.—*J. C. Boyle, vice-president and general manager.*

Eastern Oregon L. & P.

OUR COMPANY and many other businesses in this inland area actually should be classed among the casualties of war. During the year gold mining operations requiring power in the amount of 1,500 kw. closed down, which was about 20% of the total system load. Several stores and service stations have closed, and the remaining service stations and businesses have curtailed their use of sign and outside lighting.

As a result of wartime restrictions this company has no mileage of new line extensions to report for 1942. One 450-kva. bank of transformers was installed to serve a planing mill which was completely powered with electric motors. One new 50-kva. rural substation was installed and additions of 25 kva. in capacity were made for two rural substations.

The outlook for 1943 is brighter for the eastern Oregon country. Contracts are beginning to be received for work to be done by the local foundries and machine shops. Certain mining operations may soon be resumed to provide rare strategic metals found in the ores of this region. Greater consideration is being given the rural areas regarding their value in producing food required for the war effort.

Additional capacity in generating plants or transmission line capacity is not planned for 1943, and there will probably be little if any additional distribution lines built. However, load improvement with respect to loads on lines at the close of 1942 is expected. Wire size increases may be required in some cases but in general load increases will be carried on existing transformers and through the addition of transformers along existing lines.—*O. D. Lanning, chief engineer.*

Eugene Water Board

IN KEEPING with the government's request that as little new work as possible be done, 1942 saw the completion of most of the work already started, and a small amount of essential new construction. During the year 9.65 miles of line eastward from the Leaburg plant was increased from 2,300 volts to 11,000 volts, in order to give sufficient capacity to serve the McKenzie River section of the Lane County Electric Cooperative. The McKenzie River section has about 30 miles of line serving about 200 customers. Work in 1943 will be confined as far as possible to maintenance and operation.

Residential customers have increased 2% in number in the past year. The estimated number of kwh. per residential customer for the year is 2,900. The number of residential customers using electric ranges is 55.8% and water heaters 31.1%.

Through the Bonneville Power Administration connection to our system we contributed, during the low water season, to the Northwest power pool 6,175,500 kwh. of steam generated energy.—*J. W. McArthur, general superintendent-secretary.*

Mountain States Power

AN EXPENDITURE of approximately $430,000 was made for capital additions during 1942. A 66-kv. transmission 12.8 miles long was completed between Lebanon and Sweet Home, Ore., with a 2,500-kva. substation at Sweet Home. The 2.3-kv. switchboard at the Springfield, Ore., steam plant was rebuilt with modern equipment during 1942. Very few distribution lines were constructed during the year. Regulators were added in three substations. An increase in transformer capacity was made in a number of small substations.

During 1943 approximately $440,000 is expected to be spent for new additions to the system. This will include the modernization of switching equipment, increase in substation transformer capacity, and the addition of regulator equipment. —*G. McClellan, chief engineer.*

Northwestern Electric

ESTIMATED budget expenditure for 1943 is $164,600 as compared to an estimate of $310,010 for 1942. Reduction was due primarily to shortage of critical materials. No major generating equipment was added.

No new transmission lines were built but there were several line relocations necessary because of highway or street changes. Also it was necessary to reconstruct a portion of Condit-Camas 66-kv. line built in 1912-1913.

Only about 5 pole miles of distribution line (11 kv. and under) was built in 1942 and probably not more than 2 miles will be built in 1943 due to restrictions imposed by WPB. There was sold to Skamania County, Wash., PUD in 1942, 29.62 pole miles of line. Substation transformer capacity added in 1942 was 3,175 kva. and estimated for 1943 is 1,000 kva. There has been no improvement in regulation but actually a reduction because of a WPB ruling that 5% regulation is sufficient. In 1942, 10,500 kva. of shunt capacitors and 17 kva. of series capacitors were installed. For 1943, 145 kva. of series capacitors is estimated. We are installing relays assembled almost entirely in our own shops on all series capacitors.

Northwest Power System Pool operation has been very satisfactory. Diversity in load partly due to difference between Mountain and Pacific time enables the various companies involved to take full advantage of stored energy and plant capacity. Ability of participants to draw from each other during extremely low water of last summer was a great help to the war effort.

To conform to WPB regulations it has been necessary for our company to set up a rather detailed system for determining the practical working minimum of various items required for maintenance and operating supplies and to know at all times, the amount of material required to complete projects approved by the WPB. Close watch of shifting loads, due to war, is being kept in order to utilize existing transformers and other equipment. We are now using much smaller wire on services than was formerly considered advisable.—*O. L. LeFever, general superintendent.*

Pacific Power & Light Company

CONSTRUCTION expenditures for 1942 totaled approximately $528,441. The amount estimated for similar work in 1943 is $415,225. During 1942, construction was started on a 750-kw. hydroelectric project on the Deschutes River at Cline Falls, Ore., replacing a 150-kw. unit. It is anticipated that this project will be completed early in 1943. Two short sections of transmission line were constructed in 1942 to interconnect Pacific company's system in Washington with those of the Bonneville Power Administration.

In 1942, $311,740 was spent for distribution facilities, of which approximately $150,000 was for expanding service to customers not previously served, including rural customers.

Construction in 1943 will necessarily be limited to that essential to the war effort, due to the need for conserving critical materials and stringent priority limitations. It is anticipated that expenditures for distribution facilities will amount to approximately $193,000, of which $85,000 has been estimated as necessary for expanding service facilities to customers which for the most part will be in defense housing areas. Customer growth in 1943 is expected in the residential and industrial classifications, but losses in the commercial classification will result in a total of 147 less general business customers.

Expenditures in 1943 will be dependent to a great extent upon the development of wartime activities within the territory served by Pacific company, and will have to be given consideration as their requirements become known.—*H. H. Schoolfield, general superintendent.*

Portland General Electric

COMPARATIVE figures covering the actual construction expenditures of the Portland General Electric Co. for the year 1942, and the estimated 1943 expenditures, are given below:

	Actual Expenditures 1943	1943 Construction Budget
Hydro plants	$24,437	$163,500
Steam plants	16,900	6,500
Transmission	298,700	169,600
Distribution	1,438,395	643,300
General	208,100	29,600
Total	$1,986,532	$1,012,500

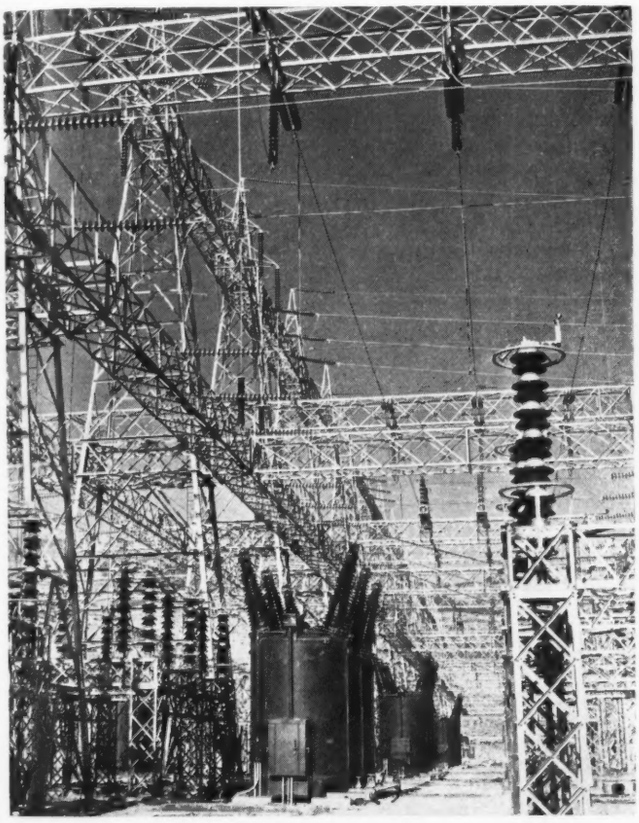
The estimated load for this company for 1943 will represent an increase of approximately double the normal rate of growth. This load, however, due to Pacific War Time and to the increased use by industrial plants, will be at a much higher load factor than normal; consequently the system peak load will only slightly increase. This means that the existing facilities will be used more intensively. A considerable portion of the growth in load will be handled through the purchase of additional energy from the Bonneville Administration.—*Walter Brenton, chief engineer.*

West Coast Power

COOPERATION with the national plan for conserving critical materials has curtailed our proposed new construction and increases of system capacities for 1943. The present transmission, distribution and substation facilities are adequate to handle peak loads under present loading conditions. It is anticipated that increases of load may occur in some districts in 1943, which may exceed rated substation capacities. This estimated increase of

load can be handled adequately by the existing transmission and distribution facilities. Forced air blast or circulation of a cooling liquid is proposed to increase substation facilities in those districts where increased loads may exceed the normal thermal capacity of the transformers.

Budget expenditures are almost entirely for maintenance and operation.



From Grand Coulee switchyard 230-kv. and 115-kv. lines radiate to Northwest load centers. This is a section of the 230-kv. yard showing how some of the 8-cycle, 230-kv., 1,200-amp. pneumatically operated circuit breakers are installed

Amounts budgeted include expenditures for estimated service extensions permitted by War Production Board restrictions.

The following is a comparison of added and proposed additional facilities for 1942 and 1943 respectively:

Generation—No increases of generating capacity were made in 1942. Work was confined largely to maintenance. Expenditures budgeted for 1943 maintenance work only.

Transmission—One short transmission line was constructed. No new transmission line or increases of capacities of existing lines is proposed. There are several instances where increased capacity would be provided under normal conditions, but these increases will not be provided unless required by war production plants.

Distribution—It is estimated that approximately 25 miles of new line were constructed, of which about 7 miles were built to serve government projects.

Power factor corrections were made in various districts by installing approximately 1,500 kva. of static shunt capacitors during 1942. No capacitor installations are budgeted for 1943. For 1943, it is estimated no new lines will be constructed unless some unforeseen war projects develop.

Substations—Additions in 1942 consisted chiefly of the installation of protective equipment. No significant increases of substation capacities were made. No increases of substation capacity or replacement of major equipment is budgeted for 1943.

The trend for 1943 appears to indicate there will be no new line extensions or additions except for war production plants. Maintenance work will be of greater importance than ever, due to urgency of supplying uninterrupted dependable electric service to present and future war loads.

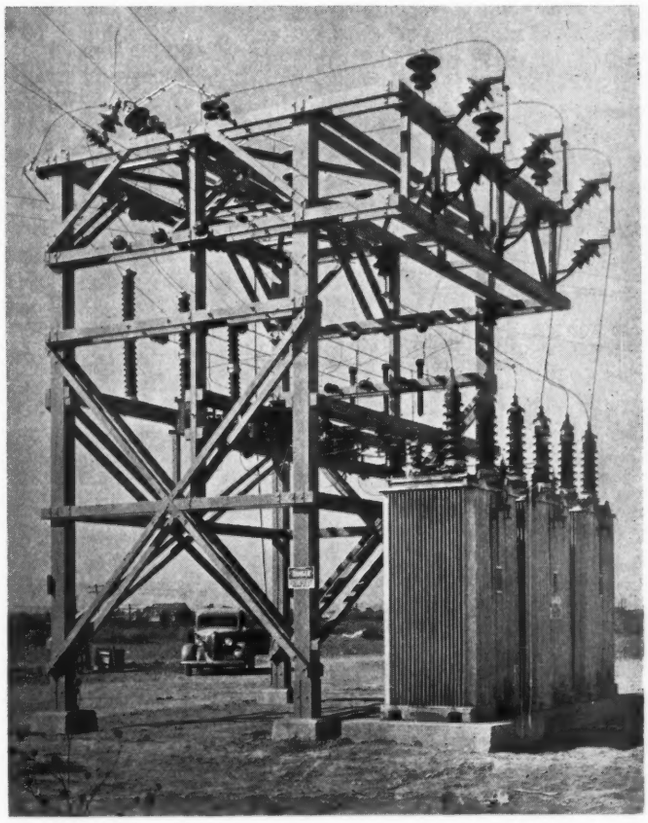
Expenditures for 1942 totaled $54,300 and $41,000 is budgeted for 1943 —*L. C. McClurkin, president.*

Utah

Telluride Power

ABOUT $65,000 was spent in 1942, for property additions and improvements. It is not likely that more than $35,000 will be invested in 1943 for such purposes unless unforeseen mining developments materialize.

War forced many changes in design practices. Typical was the substitution of wood for steel as is demonstrated in this distribution station erected last year by the Southern Colorado Power Co. Three 333-kva. transformers are installed



No additional generating capacity was installed. A by-pass water flow line and screen box were built at one of the dams, and a hydro-electric generating station building was stuccoed and otherwise improved. Improvements were made to three operators' cottages at this plant. Oil was changed in six 333-kva. transformers which were installed in 1907. The old oil had begun to sludge badly, after thirty-five years of use, due to acidity.

Approximately 11.5 miles of 3-phase. 44-kv. line were built to supply a Jap relocation center, and 4 miles of 44-kv. line burned down by a forest fire were rebuilt.

About 4 miles of distribution line were built during the year, and outdoor type oil circuit breakers were installed

on two 5,000-volt substation feeder circuits, replacing fuses. Several bicycles were purchased early in the year for use by service men, collectors, etc., and one saddle horse was purchased to conserve auto tires.

Increased taxes, the shortage of man power, the employment of new help, gas rationing, etc., are necessitating a complete reappraisal of operating practices, maintenance methods, and employee training. About the middle of the year we instituted a program of customer meter reading, using a post card-calendar system, covering about 1,000 customers in the outlying rural areas. We have had a splendid response, and likely will extend the program in 1943.—*Paul P. Ashworth, general manager.*

Utah Power & Light

THERE were no additions to generating capacity on our system during 1942. Transmission line construction included 14 miles of 44-kv. wood pole extensions to serve defense projects in this area. Distribution line additions totaled 76 miles.

The 1943 program contemplates no additions to system generating capacity. Transmission lines planned include 43 miles of 132-kv. wood pole line which is now under construction and 14 miles of 44-kv. line. It also will be necessary to convert 71 miles of 44-kv. to 132-kv. operation. Planned are 40 miles of distribution system additions. New transformer capacity totaling 15,000 kva. will be installed in transmission substations and a 750-kva., 46-kv. regulator will be added. Distribution substations will require 2,800 kva. of new transformers.—*L. B. Fuller, chief engineer.*

Washington

Columbia Basin, USBR

THE two 75,000-kva. units transferred from Shasta Power Plant of the Central Valley Project are being installed in the left powerhouse. These units will be placed in service early in 1943 and the three 108,000-kva. units, L-4, L-5, and L-6, now being installed in the left powerhouse are expected to begin operation in the latter part of 1943. All of the other construction work on the Grand Coulee Power Plant has been halted by orders of the War Production Board. The 1943 appropriation is $24,600,000.

Puget Sound P. & L.

DURING 1942 Puget Sound Power & Light Co. spent approximately $3,412,000 on construction work. It is anticipated that expenditures during 1943 will approach that same figure. In view of the uncertainties in connection with allocations and deliveries of material, plus the uncertainty as to further development of defense activities in the area served, it is difficult to forecast accurately either power requirements or estimates of facilities to be constructed during 1943.

No generating capacity was added at either hydro or steam plants during 1942 nor are any major additions to generating capacity contemplated for 1943. Minor replacements and improvements to generating plants were widely distributed and amounted to about $300,000 during 1942 and may approximate $100,000 during 1943. During 1942 110-kv. interconnections with the lines of Bonneville Power Administration were installed at Renton and at Bremerton to assist in the proper functioning of the Northwest Power Pool. At Bremerton a 7,500-kva., 110/66-kv. temporary transformer bank was installed. This bank will be replaced with a 30,000-kva. bank during 1943. A 30,000-kva. synchronous condenser was installed in the Renton switching station to assist in voltage control and provide system reactive. In order to provide for load growth in the Seattle metropolitan area 16 miles of 110-kv. transmission line was constructed from Woodinville to Canal substation where 55,000 kva. of substation transformer capacity is being installed and where a 30,000-kva. condenser will be installed in 1943.

Six distribution substations have been built which total approximately 7,100 kva. of capacity and 46,000 kva. of transformer capacity have been added to various distribution substations throughout the system. Other additional facilities added in 1942 include 18,500 kva. of distribution transformers and 78 miles of distribution lines. The number of customers increased 6,905.—*Frank McLaughlin, president.*

Seattle City Light

DURING the year 1942, no generating capacity was added to the City Light system. Our Lake Union Steam Plant was rehabilitated and placed in service for a short period of time for the benefit of interconnected utilities. No new generating capacity is contemplated for the year 1943. It is expected, however, that work will be started on a $10,500,000 extension to the Ross Dam, which will provide increased storage for the existing hydro plants at Diablo and Gorge on the Skagit River. Of the $10,500,000, approximately $4,000,000 will be expended in 1943.

No major additions to our transmission system were made in 1942. The Seattle-Tacoma tie line, which previously had been operated at 54 kv., was re-insulated and placed in operation at 110 kv. on November 23, 1941, thus increasing the capacity of this system interconnection to 60,000 kva. For 1943 a revision of the switching facilities on one of the two Diablo 220-kv. transmission lines will be made, which will enable us to raise the voltage of this line to 220 kv., thereby making available to our load and interconnected systems an additional 30,000 kw. of generating capacity. In connection with this work, the City of Seattle and the Bonneville Power Administration are jointly building a switching station at Earlington for sectionalizing the Diablo transmission line and effecting an interconnection with the Bonneville system at this point. The addition of carrier relaying on the Bonneville tie is contemplated.

Primary and secondary extensions to our distribution system continued at approximately the prewar rate, in spite of the abnormal increase in customer service. The program of feeder extensions contemplated for 1942 was seriously curtailed in order to conserve critical materials for the war effort. A 25% to 30% increase in system load was carried largely by overload capacity of existing facilities.

During the year 1943 considerable reinforcement of the distribution system will be required to meet the expected demands of 1943 peak load. Details of this program are now being worked out, based upon load records of the system peak just passed.

During the year 1942 we have completed the installation of a new 54-kv. switchyard at South Substation. This yard replaces an old 54-kv. yard in which the circuit breakers were of insufficient rupturing capacity imposed by the increased power concentration in this substation. The installation of a second 60,000-kva. bank between our 220-kv. system and our 26-kv. bus at South Substation has been completed, and an additional 6,000-kva. transformer capacity between the 26-kv. bus and the 4,330-volt primary distribution bus has been installed.

Two 3,000-kva. outdoor distribution substations have been built to serve areas of concentrated load and relieve overloaded feeders from major distribution substations.

The construction of the 12,000-kva. Columbia Substation is well under way and 6,000 kva. of transformer capacity installed. We expect to complete this station and add 3,000 kva. of transformer capacity during 1943. During the year 1943 we expect to complete the construction of the Magnolia

Substation, which was originally scheduled for completion in 1942. Through the shifting of transformer capacity between various distribution substations, we will be able to carry next winter's peaks with the addition of a minimum of transformer capacity.

Other system improvements contemplated for the year 1943 include the installation of remote metering and totalizing equipment on the three system interconnections and governor load control for the automatic control of net system interchange.

Approximate expenditures for last year and expected expenditures for 1943 in connection with the above program are as follows:

Const. Classification	Expenditures Year 1942	Estimated Expenditures Year 1943
Gen. Capacity—Hydro	$60,000.00	$4,000,000.00
Transmission	40 000.00	60,000.00
Distribution	800,000.00	850,000.00
General	60,000.00	75,000.00
Total	$960,000.00	$4,985,000.00

The operating of our system on overload capacity in order to conserve critical materials otherwise required in new construction, has made necessary a more intensive preventive maintenance program, particularly with respect to switchgear. We have for the past six months been silver plating oil circuit breaker contacts which have been overheating, and the results have been gratifying. In order to conserve critical materials and expedite construction, we have, wherever possible, rehabilitated old equipment and have placed it back in service—a program which is being followed by all utilities. We have developed substitute materials thereby eliminating the use of critical materials. A typical example of this is a concrete earth anchor for distribution line construction.

Rapid developments in this critical defense area make it impossible to predict accurately our construction requirements, but we believe the foregoing will give you the general picture of our program.—*E. C. Hoffman, superintendent of lighting.*

Tacoma City Light

DURING 1942 Tacoma started construction of its new $14,000,000 two dam, 90,000-kw. hydro project on the Nisqually River, just above its present 24,000-kw. stream flow plant at La Grande, Washington. This will increase the present 114,000 kw. of hydro to 204,000 kw., and the normal hydro generation of 450,000,000 kwh. to 780,000,000, all supplemented by 34,000 kw. of steam standby now installed. The project, as of Jan. 1, 1943, is approximately 30% completed. The initial 40,000 kw. of additional capacity, to be installed in the enlarged La Grande power house, is scheduled for operation in late 1943 or early 1944. The remaining 50,000 kw., to be installed in the new Alder power house will, upon completion, increase Tacoma's total hydro and steam capacity to 238,000 kw., an increase of 60% over the present.

In keeping with the trend towards pooled operations; to transmit surplus hydro and steam power where and when needed; to better utilize reservoirs; to conserve fuel; and to improve the efficiency and reliability of the several systems, Tacoma City Light and ten of the largest utilities in Washington, Oregon, Idaho, Utah and Montana have agreed to interconnect and now operate as a unit generally referred to as the Northwest Interconnected Systems.

A new enlarged and modernized control house and a new dispatcher's office is being built around the existing Tideflats Substation control house. A cooling tower, pump house and water circulating system has been installed at this same substation, and much preliminary work has been done on the installation of a 20,000-kva. synchronous condenser scheduled to be in operation by May 1943. A new 50/13-kv., 20,000-kva. Canal Street Substation is now under construction and is expected to be in operation early in 1943.

During 1942 our total gross generated and received amounted to approximately 770,000,000 kwh. with a sixty minute peak of 131,000 kw. This is an increase of approximately 150,000,000 kwh. or 24% over 1941.—*Verne Kent, superintendent.*

Washington Water Power

CONSTRUCTION expenditures during 1942 totaled $1,282,000. The construction budget for 1943 has been sharply reduced over the amounts expended during each of the past several years, and amounts to approximately $400,000 for gross electric construction.

The work budgeted at the beginning of 1942 provided for general betterments in an effort to place the system in condition for peak operation while materials and manpower were available. Owing to restrictions in materials and requirements for authority made necessary by the national emergency, some of the work planned has been postponed, while unforeseen requirements of certain war activities have made other jobs of primary importance.

For sometime past, several private companies in the Northwest have pooled their resources. During the early spring of 1942, this pool was enlarged to include other private and public systems, including the Bonneville Power Administration and the systems of the cities of Seattle and Tacoma. This pool has enabled the several systems to carry the tremendous loads imposed by war industries all over the Northwest with a minimum requirement of those materials so essential for military purposes, as well as averting a threatened curtailment of service for non-essential use.

Construction expenditures for generating facilities accordingly have been low, being confined to completion of minor additions of capacity in several stations, all of which began in 1941. No addition of generating capacity is anticipated for 1943. Successful operation of the interconnected power pool has for one of its requirements adequate and available communications throughout the systems. Prior to 1942, the majority of this was done by long distance telephone. It has been increasingly difficult to complete long distance calls promptly owing to the heavy burden of war communications. It was found advisable to install carrier-current communication equipment through the major systems in order to assure availability of communications for load dispatching and other operating purposes. It is believed that the relatively high cost of this installation will be offset by a reduction in toll charges, and also make for more flexible operation of the pool with savings of both money and resources. This installation was largely completed in 1942, and practically all material to complete was either on hand or in transit at the end of the year.

A 20-mile 110-kv. line was completed and placed in service between Kellogg and Burke, Idaho, to increase capacity for interchange with The Montana Power Company and to insure service to various mines in the Coeur d'Alene District. Some 5.5 miles of 60-kv. line was constructed to serve the Northwest Air Depot at Galena, Washington. This line was complete but not in service at the end of the year, pending completion of substation facilities by the army. No extension of transmission facilities is foreseen for 1943.

Distribution construction has been, and will continue to be, sharply curtailed and limited to items which, under governmental regulations, are classed as essential to the war effort. This will, in the main, be in addition to substation and primary capacity in areas where additional housing is being provided for use of employees of the various war industries located in the Spokane area. While undoubtedly some critical material will be required, every effort will be made to supply as much as possible by relocating and re-arranging present facilities to effect as efficient utilization of existing equipment as possible.—*J. E. E. Royer, vice-president and general manager.*

NOW IT'S REPAIRS

Liquidation of appliance stocks during 1942 results in surprising yearly totals. Dealer mortality varies in different sections, will increase in 1943. War production loads offset domestic and commercial losses. Sales personnel is converted to utilization

WITHOUT being either prophets of doom or naively optimistic, an examination of the far more meager reports than ordinary respecting the sales and commercial situation is worth its while in interest if not in immediate profit.

There is good reason for the meagerness of facts. Personnel in the commercial end of the electrical business has either (1) been drafted, (2) enlisted, (3) gone to work in a war plant, or (4) if still on the job, has been converted to a variety of customer service and utilization activities. There has been no time, in most instances, for surveying and compiling the statistics which have been found so useful to a going concern but cannot but be academic when there is no business to use them to obtain.

Everyone has opinions as to what has happened to the sales end of the business—ranging from "gone for the duration" to "gone to hell." But it has been neither. There is still considerable electrical business, and in some cases 1942 business was as good as that in 1940. Believe it or not, there is still some merchandise, in some places—not much, true, but some.

There have been swings from the usual to the unusual—but in wartime what is not converted or changed in some manner? Repairs and appliance service have been turned to by from 10 to 50% of the surviving electrical dealers. Others have swung out of electrical merchandise into furniture, housewares, other lines—even clothing. The opinions, as to probable mortality this year, expressed confidentially in each instance by the utilities reporting and hence not given here in detail, range from "none" to "100%"—extremes of course, but the majority lies within the guess of from 20% to 60%.

In the making of this survey, ELECTRICAL WEST and *Electrical Merchandising* summarize a total of 9,361 dealers as reported by 37 utilities. This number was in business at the beginning of 1942, and their number had been reduced to 7,558 at the end of December, a drop out percentage of 19.26%. Estimated to go out in 1943 are 2,169 more, about 28.7% of the remaining 7.558, which will bring the total loss percentage to 42.43%. From the West alone, 18 utilities reporting, there had been 4,307 dealers at the start of 1942, and 986 or 43% had already closed during 1942. There is no unanimity of opinion on percentage of further loss of dealers expected in 1943 in the West but it averages close to half of the remaining dealers.

This mortality of dealers is not confined to electrical dealers. In a report prepared by Raymond Reeves, regional business consultant of the U. S. Dept. of Commerce, San Francisco, dated Dec. 1942, covering the region including Alaska, California, Hawaii, Idaho, Nevada, Oregon, Utah, Washington and all but five southeastern counties of Arizona, the plight of all small dealers is graphically told.

Check by him of all retail hardware firms in the six-month-old San Francisco telephone directory found only 3.8% actually out of business but 13.5% anticipated having to close within six months; yet 82% reported that they believed they could continue in business for the duration.

Radio and electrical appliance dealers were harder hit. His check showed that 36.6% of those in business six months previously had closed or were in the process. Another 17% had decided to close within the next few months as their stock of repair parts and merchandise became exhausted. Less than half

Expert repairmen are essential these days if electric appliances are to be kept on the job for the duration. Such is Pete J. Bottino, repairman for Eastern Utah Electric, who can fix almost any type of appliance

or 46.4%, felt they could stay in business for the duration. Those who reported they thought they could remain had large stocks of repair parts. Skilled men for their shops were their worry.

This same survey of the Dept. of Commerce reported retail business closings for the 12 months after Pearl Harbor as 8.5% in contrast to the 4.4% for the prior 12 months in the Pacific Northwest. Closings were more frequent among smaller stores—those of less than $10,000 annual sales volume having 19.1% closing as against 2.2% for those of over $100,000 volume.

Some of the specific estimates from various utilities appear in the reports which follow. Before leaving the dealer phase of the present situation, the annual report of that zealous secretary-manager of San Diego's Bureau of Radio and Electrical Appliances has in it some opinions and observations that reflect the stocks available in some instances and the part that ingenuity will play in their survival.

"Here is about the way the year looks to us. Appliance stocks will continue to trickle in from obscure sources. Don't be surprised to see job lots of this and that show up shortly, now that profits are credited to 1943 business. Possibly a few middle men were just as smart as some of our dealers who commenced holding back stocks when maximum profits for the year had been reached. But at best, such stocks can't help a great deal against the buying splurge that simply won't be discouraged by the threat of taxes, unless rationing becomes general. We do look for rationing of some things, including ranges and refrigerators (assuming the government decides to release a good portion of the vast quantity of deluxe models it does not intend to use).

"OPA will undoubtedly soon issue regulations to control the sale of used ranges, washers and vacuum cleaners, much as refrigerators are covered now. Doubtless there will be many other forms of control that we can't now foresee, but there is no reason why such obstacles cannot be taken in stride, just as we have been doing this last year.

"Critical shortages in certain repair materials and supplies have a good chance of relief, now that manufacturers have been granted priorities to turn out needed repair parts, radio tubes, etc. It may take some time before the effect of this set-up is felt here, but there seems to be ample evidence that appliance repair is considered essential.

"Manpower difficulties will rank number one on our list of 1943 troubles. Despite the fact that draft deferments can frequently be secured for repairmen, the pressure or attraction of war industries will keep us constantly fighting to retain necessary repair forces. The general efficiency of our work will be lowered as less capable men are worked in to replace those lost. It will take all our ingenuity to keep up with the demand for service, but this is an obligation we must not shirk. The vital importance of appliance service probably will be recognized governmentally, to make this task easier. We believe that by mid-year, a refrigeration mechanic, for example, will be considered every bit as necessary to the war effort as any man at Consolidated Aircraft.

"Appliances will probably be completely gone before this time next year, but we expect most of those who sell and repair them still to be here. We shall of course direct our program and every resource at our command to help make this possible. We still believe in the future of this industry!"

One of the surprises of the year past was that there was still so much electrical merchandise left to sell. The reported total sales of appliances in most cases are nearly those of the previous year, in ranges and water heaters particularly. Unfrozen refrigerator stocks were cleaned out early. But Seattle with its range sales and particularly its automatic electric water heater sales is amazing. Only the end of manufacture of merchandise stopped an almost all-out all-electrification, as the report herein shows.

Wiring during the past year, except for tremendous war projects—which touched all time highs—fell off to just short of nothing for 1942 as electrical permits for the key cities of the West indicate.

Contrary to expectations the kilowatt-hour average annual consumption figures remained high and in most cases even went higher in 1942, despite the advent of large blocks of low cost war housing, restricted in their uses of electricity both by the below-minimum wiring and the lack of appliances. Topping all was Eugene, Ore., with its 2,900 kwh. and now seven utilities have average annual domestic consumption of over 2,000, and 14 more over 1,000, which used to be the goal line not many years ago.

A general change in classification of accounts to conform to the Federal Power Commission rules will make past figures of doubtful value as bases of comparison. Now the rural and domestic consumers are all grouped together and meters are counted, not residence units. This makes an average less comparable between one company and another and between future years and the past.

Surprisingly few load losses were reported, and in most cases these were made up by gains in industrial load. The losses invariably were in commercial load and in some cases domestic. Estimates of load loss due to dimout are incomplete. Like specific details about industrial load increases, some utilities may have considered such information military secrets; that or they were too busy to compute them.

Uniformly utility commercial personnel was depleted, and all of it converted to customer service and utilization or nutritional class work for home service. Some even call them salesmen no more, they are utilization engineers or advisors, since there is nothing to sell but patience and goodwill and the more careful use of equipment and electricity.

In reproducing the following reports,

Who ever thought it would come back to this? A sad, sad state of affairs!

Mrs. Potts' Sad Irons

No electric iron? Use sad irons! Set of 2 irons with 1 detachable handle that fits both irons, plus stand. Usable on any stove. 15 sets only..... set **1.95**

Kahn's, Household, Third Floor

CUSTOMERS AND CONSUMPTION

NAME OF UTILITY	Average annual kw.-hr. consumption—Residential					Residential Customers			Rural Customers		Commercial Customers		Industrial Load change	Total of all Customers	Total of all Customers 1941
	1942	1941	1940	1939	1938	1942	1941	Load change	1942	1941	1942	Load change			
Alameda, City of	1,092	1,044	1,080	1,142	971	12,300	11,782	+552			1,450*	−252	+12,705 hp.	13,750	13,332
B. C. Elect. Ry., Vancouver	926	926	909	1,026	1,003	84,900	81,961	+375	18,200	16,653	15,650	+4,000	+12,750 kw.	118,750	114,760
B. C. Elect. Ry., Victoria	860	860	839	901	760	23,353	22,159	+2,300	4,263	3,918	3,845	+330	+1,089 hp.	27,615	26,419
Calif. Elect. Pr.	1,310	1,314	1,349	1,376	1,370	28,400	27,029		1,500	1,463	4,775*			40,000	
Calif.-Oregon Pr.	2,680	2,558	2,385	2,243	2,167	28,546	28,044	+2,299	3,432	3,642	6,590	−859	+838 kw.	38,797	39,456
Central Arizona L. & P.	1,140	1,088	1,124	1,038	975	30,000†	29,300†				4,500			35,000	33,729
Deming Ice & Elect.	730	714				820	749	+11%	142	139	316	+12%	+40%	1,278	1,196
Eastern Ore. L. & P.	1,308	1,167	1,056	919	850	5,555	5,950	−150	866	871	1,064	−600	−1,100	7,485	8,003
Elko Lamoille Pr.						1,110	1,156				430			1,540	1,599
Eugene Water Bd.	2,900	2,752	2,602	2,379		9,580†	9,001†				1,600			11,150	10,683
Glendale, City of	1,101	1,112	1,032	1,010	971	26,850	26,352		144	143	5,000	4,980		31,994	31,475
Hawaiian Electric		1,411	1,244	1,123											
Idaho Power	2,130	2,018	1,946	1,855	1,719	41,562	42,439		18,323	18,407	6,409	6,861		67,880	69,275
Los Angeles B. P. & L.	985	998	954	886	838	440,000	440,122	+15,750			97,500*	97,378*	+69,265	533,500	537,500
Modesto Irrigation Dist.	1,600	1,540	1,773			4,857	4,757	−400	5,588	5,388	3,000	3,025	−400 +1,000	13,445	13,170
Mountain States Power	1,515	1,410	1,362	1,286	1,247	47,000	55,000		8,500		8,500			64,000	48,684
Northwestern Elect.	2,125††	1,729	1,529	1,423	1,354	40,445†	37,177			5,154	6,112	5,522		47,629	968,039
Pacific G. & E.	1,071	1,070	1,027	985	945	825,000†	764,540†		160,000		167,088			185,000	
Pacific Power & L.		1,802	1,689	1,606	1,550		1,416			7		381		1,797	
Pasadena, City of	950	1,027	1,023	981	929	29,165	29,065	−1,000	4,735		4,703	−8,000	+1,000	33,900	33,768
Portland Gen. Elect.	1,935	1,698	1,518	1,390	1,317	136,269†	131,552†		13,309		14,188			150,766	146,899
Public Service Co. of Colo.	790	781	749	700	635	118,150	115,105	+3,746 kw.-hr.**	17,400	5,580	18,539		+71,933 kw.-hr.**	147,548	145,712
Puget Sound P. & L.	1,975	1,716	1,511	1,391	1,205	204,000†	194,868†		22,800	5,479	24,370			227,500	220,132
Rawlins Electric	731	717	703	655		1,417	1,416		375		381			1,799	1,797
San Diego G. & E.	1,064	1,048	994	953	896	102,270	93,019	+12,358 kw.-hr.**	14,385		14,482	+28,853 kw.-hr.**	+71,599 kw.-hr.**	121,702	112,615
Seattle, City of	2,611	2,062	1,703	1,492	1,384	85,277	81,947	+50,000 kw.-hr.**	11,872		12,284		+70,000 kw.-hr.**	98,210	95,446
Sheridan County Electric	770	748	747	670		2,861	2,967	+155 kw.-hr.**	844	554	866	−90 kw.-hr.**	+450 kw.-hr.**	4,299	4,387
Sierra Pacific Pr.	1,738	1,682	1,591	1,466	1,440	13,514†	13,202†		2,301		2,537			15,942	15,991
Southern Calif. Edison	990	1,005	984	972	945	582,221†	561,060†	8,733 kw.-hr.**	43,800		43,584	+25,900 kw.	+100,500 kw.-hr.	626,021	604,644
Southern Colo. Pr.	1,018	975	932	891	838	21,599	21,714	+547 kw.-hr.	1,685	1,744	4,393*	−301 kw.	−3,314 kw.	27,707	27,756
Tacoma, City of	2,744	2,435	2,185	1,961	1,804	37,065	35,367	+18,850 kw.-hr.**			3,956	4,029	+888 kw.-hr.**	41,845	42,438
Utah Power & Light	1,243	1,246	1,212	1,140	1,068	118,771†	109,953†				12,425	10,294		134,784	122,931
Washington Water Pr.	2,460	2,348	2,284	2,060	1,985	70,420	69,127	+1,400 kw.-hr.	12,847	12,847	13,709	14,603	−400 kw. +3,400 kw.	97,828	97,100

*Includes industrial. †Includes rural. ††New basis of counting customers. **Kw.-hr. in thousands.

where direct statements were made they have been quoted. But where only answers to the questionnaire were given the editors have prepared the information, and the name and title is that of the author of the information, not necessarily the text.

Arizona

Central Arizona L. & P.

AS a result of our consistent dealer cooperation, dealers ask and receive our assistance in training of service personnel. From experience so far we feel that dealer service will be adequate to take care of the demand for repairs. Of the 201 dealers in the territory Jan. 1, 1942, only about 10% have gone out of business, their owners mostly going into defense jobs. About 80% have added other lines, chiefly furniture and housewares and about 50% have gone into repair service.

Customer appliance repair promotion was carried on in 1942 over radio, by direct mail and by the home service program. The same is planned for 1943. Public response has been good.

Advertising in 1943 will be institutional, educational and dealer help, together with defense activities, bond sales, nutrition, etc. Our sales staff now consists of 11 customer contact, 2 dealer contact, 4 commercial and industrial and 5 home service people. Reduced personnel and problems of the times did not allow for compilation of sales results for the year.—*J. T. Deppe, manager residential sales dept.*

California

Alameda Bureau

INDICATIVE of the growth in industrial load due to war production and government installations in the area served by the Bureau of Electricity, City of Alameda, Calif. is that for 11 companies or government installations the peak load a year ago was 4.542 kw. and for the same group now it is 13,215 kw. While domestic and industrial load showed an increase, commercial load dropped 252 kw. It is estimated that 16,000 kwh. monthly is being lost because of dimout and blackout reduction of lighting.

Ranges remaining in dealers stocks were estimated to be: 50 new and 15 used ranges. The bureau employs no selling or contact people now. Promotion has consisted of newspaper advertisements suggesting that appliances be brought to dealers for repair. Repair

shops are kept busy and are handling the demand to date. In 1943 similar ads will be carried. Of the four dealers Jan. 1943 one has gone out of business. *—G. A. Baxter, secretary.*

California Electric Power

PRACTICALLY all of the gold and silver mining load of California Electric Power Co. has been lost to it for the duration by order of the War Production Board, but the company has added some load from war units to offset the loss. Monthly kilowatt-hour loss of load because of dimout and blackout however is 40,000.

The company has no data as to dealer sales. Its own stock of new ranges was 100 and it had 15 ironers at start of the year. The sales staff consists of one appliance salesman, ten on customer contact, one on commercial and industrial and three on home service.

No repair promotion was carried on in 1942 and none is contemplated for 1943. The company is instructing customers through pamphlets and personal calls to care for their appliances and of the need for maintenance. Of necessity, because of manpower and transportation shortages, service calls have had to be scheduled and part of such calls, where equipment is older than the guarantee, is referred to dealers' servicemen. This will be continued. The public has been very cooperative. Dealers so far seem to be able to handle the demand. If it should ever become inadequate we have always taken over service in so far as it is possible and plan to continue to do so as long as we can.

Advertising plans in 1943 call for about 30% institutional, 40% educational and 30% dealer help appropriations.—*D. B. Wheelock, general commercial manager.*

Coast Counties G. & E.

A PLAN for distributing wartime population to the benefit of both community and individual has been worked out at Santa Cruz, Calif., by a Coast Counties Gas & Electric Co. engineer, Charles Grunsky.

The program was initiated by Grunsky as president of the local Chamber of Commerce, when departures for service in the armed forces and to war production centers began to drain off the year-round population, and fear of its location on the coast threatened to deprive the resort town of its stock in trade—summer vacationists.

Instead of folding up for the duration, the Chamber of Commerce answered the challenge; started a vigorous publicity campaign to persuade non-essential population to move from overcrowded areas to Santa Cruz, where living is pleasant, rents comparatively low. Families of Army and Navy personnel and of war workers coming into the state without places to live were told the advantages of Santa Cruz; owners of homes in congested centers who might now be in the "parasite" class were urged to rent them and come to Santa Cruz.

The result was a mild boom for the city. More sales of real estate were reported than at any time other than at the height of the government housing plan two years ago. Where formerly there was a surplus now there is almost a scarcity of better homes. Gas and electric, water and telephone services showed marked increases at a time of year when loss in connections is general. Bankers have hundreds of new accounts.

Cooperation of the State Council of Defense was enlisted, making available a 15-minute program on about 20 stations of Columbia Broadcasting Co.'s Pacific Coast network. This dramatic presentation of the housing shortage in war centers and the need to move non-essential population elsewhere was recorded and presented later in additional communities.

The same appeal was made through newspapers, through service clubs in congested areas and by word of mouth. Lt. Col. Robert C. Murply, retired, chairman of the Chamber's housing committee, wrote letters to every military establishment and navy post in the country, suggesting Santa Cruz as a wartime home for families of men in the service. These letters were in triplicate and carried the request that they be posted in conspicuous spots.

A more recent effort is to bring some 500 families of shipyard workers into Santa Cruz to occupy apartments, auto courts and small houses normally filled during the summer season and idle during winter months. This is being done through shipyard housing departments, with the yards cooperating effectively. These shipyard workers are housed in dormitories and when their families, against advice to the contrary, follow them to California, they are told to report to the Santa Cruz Chamber of Commerce. It is anticipated that these families can return to the Bay Area in the spring when new housing developments are available.

To counteract adverse publicity from early war rumors that Santa Cruz was closed as a resort, letters were sent to all state newspapers and to every Chamber of Commerce and travel bureau telling the true situation. Gas distributing companies passed along the word to service stations and announcements were made on radio stations throughout the San Joaquin valley. The result was an influx of vacationists last summer, surpassing previous records.

Glendale Public Service Dept.

THE City of Glendale has not done any merchandising of new ranges since 1937. However during the last few years we have disposed of some 800 ranges which were used in our trial plan and consequently at the present time we have no one in our employ in the range division but the home economist who handles requests for wiring installations, trouble complaints, and makes field calls only when absolutely necessary. We still maintain a service division to take care of consumers' complaints and repairs of electric ranges on consumers' premises.

Since last February we have had no one available to keep up the record work on the installation of ranges, removal, sales made by dealers, number of dealers and per cent of dealers that have gone out of business during the last year; therefore most of the questions in that respect must remain unanswered.

There was an increase of approximately 10% in industrial load during the past year. We estimate the loss of load due to dimout to be about 500,000 kwh. monthly.—*P. Diederich, superintendent of public service.*

Los Angeles Bureau of P & L

BOTH direct and indirect aid in the war effort is being called for from the Business Agent's Division of the Bureau of Power & Light of the City of Los Angeles. At the same time we are carrying on close dealer cooperation as in the past.

Because wiring materials are needed in other uses our promotion in aid of the direct selling of electric appliances by dealers is largely confined to prospects occupying homes already wired for major electric appliances who are at present using other types of equipment. In order to promote the proper use of electricity during the war and protect our market after the war our efforts in advertising are directed towards emphasizing the desirability of electric uses and the necessity of maintaining and using home electric equipment carefully and wisely.

The home economics unit has found an increasing response to its activities directed principally along nutritional lines, in cooperation with the American Red Cross canteen and nutrition program. Likewise it has worked with industrial plants for the benefit of war workers and their families.

There were 135 dealers in this utility's territory in January 1942, of which 44% have gone out of business, 60% added other lines, mostly furniture and pottery. About 80% of the remaining dealers are emphasizing service and repairs.

UTILITY AND DEALER APPLIANCE SALES—1942

UTILITY TERRITORY	Residential Customers	Total Dollars Volume of Sales	% Sold by Dealers	RANGES						WATER HEATERS						
				% Satur.	1942 Company	1942 Dealer	Total 1942 Sales	1941 Company	1941 Dealer	1941 Total	% Satur.	1942 Company	1942 Dealer	Total 1942 Sales	1941 Company	1941 Dealer	Total 1941 Sales
Alameda, City of	12,300		100	20		100	100		160	160	5						
B. C. Elect. Ry., Vancouver	84,900	1,200,000	72.5		190	262	452	427	902	1,329		135		135	84		84
B.C. Elect. Ry., Victoria	23,353	450,000	80	13	46	39	85	113	103	216	5	40		40	39		39
Calif. Elect. Pr.	28,400	400,000	50	25	225			403			15	143			227		
Calif. Oregon Pr.	28,546	358,672	60	48.9	721	298	1,019	2,378	1,524	3,902	30.3	555	246	801	2,265	1,052	3,317
Eastern Ore. L. & P.	5,555	145,000	100	37		104	104	225	133	358	12		82	82	195	68	263
Hawaiian Electric																	
Idaho Power	41,562	3,800,000	93	57	599	2,862	3,461	772	4,501	5,273	26	725	1,054	1,779	801	1,694	2,495
Los Angeles B. P. & L.	446,000		100	6.5		2,100	2,100		3,819	3,819	3		1,500	1,500		1,333	1,333
Modesto Irrigation Dist.	4,857		100	62		180	180		165	165	28		48	48		63	63
Northwestern Elect.	40,445	1,946,700	100			1,430	1,430		3,248	3,248			1,225	1,225		1,646	1,646
Pacific G. & E.	825,000	18,000,000	95	10			4,576			8,334	6			2,859			4,172
Pasadena, City of	29,165	250,000	100	6.1		50	50		250	250	2.5		19	19		45	45
Portland Gen. Elect.	136,269	6,000,000	100	34		6,000	6,000		9,450	9,450	14.2		3,500	3,500		3,925	3,925
Public Service Co. of Colo.	118,150	1,180,000	50	7	270	67	337	640	160	800		80	20	100	190	47	237
Puget Sound P. & L.	204,000	3,377,625	60	37.3	750	5,670	6,420	1,300	12,000	13,300	19.3	825	4,860	5,685	1,150	8,500	9,650
Rawlins Electric	1,417	35,000	100			7	7		15	15						1	1
San Diego G. & E.	102,270	3,500,000	90	6.5			400			700	4.7			450			500
Seattle, City of	85,277			62	1,482	6,897	8,379	3,447	4,285	7,732	23	1,545	7,142	8,687	2,984	1,312	4,296
Sierra Pacific Pr.	13,514	500,000	100	56.6		566	566		1,252	1,252	17.3		149	149		357	357
Southern Calif. Edison	582,221	10,680,480		8			2,319			4,814	3			957			1,503
Southern Colo. Pr.	21,599	110,000†		28	127			277			6	40			110		
Utah Power & Light	118,771	5,210,118	99	45		3,232	3,232		6,075	6,075	8		982	982		1,105	1,105
Washington Water Pr.	70,420	3,800,000	95	36	151	2,300	2,451	566	4,786	5,352	31	160	1,240	1,400	558	3,161	3,719

†Company only.

UTILITY TERRITORY	REFRIGERATORS							WASHERS		IRONERS		CLEANERS		RADIOS		AIR HEATERS		IES LAMPS	
	% Satur.	1942 Company	1942 Dealer	Total 1942 Sales	1941 Company	1941 Dealer	Total 1941 Sales	1942 Sales	1941 Sales	1942 Sales	1941 Sales	1942 Sales	1941 Sales	1942 Sales	1941 Sales	1942 Sales	1941 Sales	1942 Sales	1941 Sales
Alameda, City of	75																		
B. C. Elect. Ry., Vancouver	20	295	759	1,054	498	2,690	3,188	698	2,761	11*	90	306	642	4,474*	9,260*	250†	367†		
B.C. Elect. Ry., Victoria	20	80	120	200	129	340	468	350*	684*			100	179	2,000*	3,328*	110	156		
Calif. Elect. Pr.	70	380			716			179†	262†	110†	63†					110†	168†		
Calif. Oregon Pr.	65	143	440	583	1,551	2,870	4,421	678	2,043	104*	345	472	1,390	1,053	3,797	350	508	1,105	5,940
Eastern Ore. L. & P.	82		330	330	208	569	777	415*	639	35*	72	80*	232	900*	1,050*	75*	79	475*	751
Hawaiian Electric																			
Idaho Power	56	141	3,997	4,138	544	8,834	9,378	4,710	6,436			1,667	2,207	11,230	11,870			6,916	7,909
Los Angeles B. P. & L.	65																		
Modesto Irrigation Dist.	90		204	204		550	550	149*		32*		115*		340*		6*		40*	48*
Northwestern Elect.			1,949	1,949		6,475	6,475	2,685*	3,870*			1,252*	2,792*	8,588*	11,475*			6,848*	9,228*
Pacific G. & E.	65			27,203			87,823	34,448*	52,348*	7,554*	10,548*	21,761*	34,682*	111,713*	162,925*	7,386	7,377		
Pasadena, City of	76		875	875		2,050	2,050												
Portland Gen. Elect.	63		6,500	6,500		12,000	12,000	8,000*	8,500*	2,000*	1,000*	5,000*	7,000*	28,000*	22,000*	10,000*	1,500*	20,000*	17,000*
Public Service Co. of Colo.	52	760	1,773	2,533	2,549	5,947	8,496	783	2,940	717	1,401	2,030	5,051	2,000	2,680	140	166	2,666	7,220
Puget Sound P. & L.	60.9	120	7,170	7,290	400	33,000	33,400					25*		70*				20,000*	20,000*
Rawlins Electric	70		45	45		215	215	110*		18*								125*	300*
San Diego G. & E.	78			3,000			11,750	4,000	6,850	800	1,100	3,500	4,500	24,000	20,000	2,500	2,400		
Seattle, City of																			
Sierra Pacific Pr.	75		589	589		1,769	1,769									23*	66*		
Southern Calif. Edison	65			12,536			41,799	13,622	32,528	2,514	5,206			46,610	69,090	2,000	2,036		
Southern Colo. Pr.	80	83			159			31†	26†	17†	18†	48†	59†			33†	30†	98†	371†
Utah Power & Light	84		5,759	5,759		17,196	17,196	7,685*	11,645*	777*	938*	4,439*	7,245*	19,885*	22,748*	837	991	14,050	17,796
Washington Water Pr.	76	4	3,700	3,704	101	11,837	11,938	3,957	7,305			2,445*	3,038*	15,545*	18,911*			9,174	13,757

*Dealers only. †Company only.

Although no customer appliance program was carried on in 1942 because most repair service stations had a backlog of three to five weeks work, an appliance repairman's training program has been inaugurated and promotion of repairs will be made in consumer contacts and in supporting advertising. Efforts will be made to encourage expansion of existing dealer repair facilities. The indicated response from dealers so far is encouraging although the program is just beginning.

This repair training program is a cooperative one between the industry, trade schools and the U. S. Employment Service.

During the past year there have been no campaigns on account of the scarcity of appliances and wiring. Our advertising was continued but changed from an urge to buy to an appreciation of the advantages of electric usage. Home service was changed over to Red Cross canteen and *Health for Victory* classes. Advertising in 1943 will continue to stress continued use of electricity, the advantages of appliances, and will encourage appliance repair as soon as dealers are in a position to handle the work.

There were about 500 new, 25 used ranges, 100 water heaters, 10 used water heaters remaining in stock at the end of the year. Staff of the Business Agent's Division no longer has any appliance sales people, but does have 20 on customer contact, 25 on utilization, 5 on dealer contact, 9 home economists and 33 on commercial and industrial sales.

In the commercial-industrial field our power consultants are meeting increased demands by consumers for advisory service for proper illumination, and by war industries for specialized applications of power and heating. War loads in considerable amounts are still being added to our lines, requiring provision for adequate service. There was an increase of 15,750 kw. of domestic load added in major appliances in 1942, and 69,265 kw. of industrial load. An expected 149,530 hp. of active load will be added as a result of the large shipbuilding and aircraft plants but not including the aluminum reduction and extrusion plants and synthetic rubber plants.

Following the lead established by the Office of Civilian Defense in the interest of the war effort as well as of civilian defense morale and health, our consultants have been busy advising consumers respecting blackout and dimout requirements. This assists the authorities in enforcing Proclamation 12, yet at the same time prevents excessive and unnecessary reduction in the use of lighting equipment.

As to the new year we shall continue our advisory services to the extent justified by the need, in residential, commercial and industrial fields. Our planning also is in the direction of promoting to the greatest extent possible the repair of electrical appliances, cooperating with dealers and others in establishing repairmen training programs through local educational facilities and publicizing the necessity of maintenance of equipment through advertising and in other ways.

Our service activities probably will include some form of routine contacts with residential consumers, having the purpose of assisting in their wartime electrical problems. Likewise it will build up a market for the time when manufacturers will again be turning out peacetime products. — *Charles Snyder, business agent.*

Modesto Irrigation District

A 1,200 kw. drop in peaks was felt by the Modesto Irrigation District system when daylight saving went into effect. Load losses of 400 kw. domestic, 400 commercial and 400 municipal power experienced in 1942 were partially overcome by a gain of 1,000 kw. industrial. A large U. S. Army hospital also added 600 kva. to the system.

Doing no merchandising the district's seven dealers cleared stocks with the exception of 20 new and 12 used ranges, 15 new ranges, 2 used ironers, 15 new cleaners, 8 used cleaners, 150 new radios, and 5 used air heaters. One combination dealer and customer contact man is employed. One dealer went out of business, and all of them now emphasize service and repair. Advertising will be continued in 1943 along educational and dealer help lines.— *Oscar Rostad, commercial manager.*

Pacific Gas and Electric

IT IS quite a departure from anything we have done before, but then our entire way of life is different during these times, all of which adds up to one thing—Victory. Manpower losses in our public contact group of employees have been heavier than average. As a result our remaining force has been redirected to work necessary to the war effort. Therefore our wartime sales service plan stresses the duties and responsibilities of company and personnel in the various fields of activity.

Agriculture

Directly assist in the fulfilment of the California 1943 Food for Freedom quotas, a billion dollar goal. These food products are essential to help feed the growing armed forces as well as the civilian population. Agricultural products needed in industrial processes are likewise vital to the war effort. Under war conditions the objectives of our agricultural plan are to:

a. Maintain to the highest possible standard the gas and electric power service rendered agricultural customers.

b. Extend these services wherever possible in the best interest of the Food for Freedom program and the general war effort.

c. Work with customers to utilize vital materials to the best interests of the Nation and in harmony with the stipulations of authorized government agencies.

d. Aid our agricultural customers in the fulfillment of their obligation to the war effort.

e. Cooperate with equipment manufacturers in servicing and distributing the available supplies to the best possible advantage.

f. Work with county, and state USDA war boards on the processing of farm electric power service applications.

g. Work with the farm machinery advisory committee of the state USDA war board to promote preventive maintenance of farm electrical equipment.

h. Assist customers, dealers and repair shops with material priority information.

i. Through advertising, publicity and lecture demostrations carry on an educational program along the above lines.

j. Continue our agricultural pump testing service, which is obviously more important now than in normal times.

A total of 41 people, 28 of whom are farm advisors, 12 pump testers, will serve the 72,635 farm customers and assist the 668 farm equipment dealers through the 13 divisions of the company.

Commercial and Industrial

As northern California is a defense area, we cannot be specific regarding industries or their loads. There have been large increases in the agricultural load, gold mines shut down by WPB orders have cut the mining load. However we expect further expansion of war industries in 1943.

There are 160,000 commercial and industrial customers served by the company, having a connected load of over 3,000,000 hp. and utilizing 63% of the electric energy sold by the company. Growing war production will require during 1943 electric service for an additional 600,000 hp. connected load. Objectives for the year include:

a. In the industrial field — render every possible assistance in the extension of our services to new war production industries. Maintain continuous and satisfactory service in existing plants and improve efficiencies wherever possible to the end that maximum production will result.

b. Commercial — Assist such customers through the most efficient use of

*Dealers only. †Company only.

Moving gears point a timely moral in this Pacific Gas and Electric Co. display. Background is slate blue; lettering mineral orange. Wooden gears are bronze color, move at the rate of 45 rpm

electricity to meet the expanding demands being made on them by a rapidly increasing population largely made up of war workers and military forces in the area.

Staff for this job totals 67, 5 of which are supervisors, 6 commercial representatives, 16 illuminating engineers, 22 industrial power engineers.

Domestic

In the residential field our activities are aimed to maintain morale on the home front. To that end we will retain a limited number of workers to assist new domestic customers secure service and to acquire the dwindling supply of appliances. More specifically the program calls for:

a. Carry on essential negotiations to supply new customers in view of wartime standards and regulations. This includes working with those building war housing, supplying WPB information, making a check of the condition of all appliances on each service call, giving information on care of appliances (*The Lady of the House and Her Mechanical Servants* booklet), arranging for appliance repair, showing how to repair cords and replace fuses, helping customers purchase used equipment, giving air raid and dimout information.

b. Dispose of appliances or lighting equipment still in stock.

c. Work with groups of customers—educational classes on nutrition, etc.

d. Work with dealers, wholesalers and manufacturers. Make available to dealers company stocks of ranges under a mutually beneficial plan.

e. Assist the Northern California Electrical Bureau in its cooperative activities.

f. The Durationize program—authorized service dealers, and lists of them referred to customers.

Manpower for this will total 116 in all divisions and in eight classifications of activity. Need for their services because of dwindling manpower throughout the industry is greater than ever this year and our organizational set-up has been designed to make the most effective use of all agencies to better serve the public.

Of the 1,220 dealers in PG and E territory in Jan. 1942, about 15% have gone out of business. About 30% have gone into other lines, including department store, furniture, hardware. About 10% have added other lines, such as clothing, furniture, paints, crockery, ice boxes, dishes. In close survey of dealers for the authorization under the Durationize program we find about 40% now stressing repair service. An interesting means of survival has been noted in several instances. The dealer himself works in a war plant during the day and his wife or a relative keeps the store open.—*O. R. Doerr, general sales manager.*

Pasadena Light & Power Dept.

Although nothing was done on customer appliance repair promotion in 1942, we, in common with other utilities in this area, are entering in a cooperative educational plan for all the southern California area. About 35% of local electrical dealers have gone out of business, most of them going into war industries.

Stocks of appliances remaining approximated 75 new and 15 used ranges; 15 new water heaters; 250 new and 50 used refrigerators. Our domestic and commercial loads suffered a decrease. We estimate the loss of load through blackout and dimout to be 30,000 kwh. monthly.

Industrial load, however, showed a 1,000 kw. increase. Numerous small industrial plants are taking over the available building space in this area. We have one customer contact and one commercial and industrial man on the staff.—*B. F. De Lanty, general manager, municipal light and power dept.*

San Diego Gas & Electric

BECAUSE the few remaining appliance repair men in the area have more work at present than they can handle, San Diego Gas & Electric Co. has adopted a program for 1943 which will assist the dealer with his service problem and at the same time help the utility retain its domestic load.

Emphasis is on training the customer to help himself. In this connection the company, in cooperation with the Bureau of Radio and Appliances, has prepared a 64-page booklet on use, care and repair of electric appliances. This manual explains which troubles can be remedied at home and which are definitely a serviceman's job.

These educational booklets are distributed through the Women's Division of the Civilian Defense. A series of four meetings for block wardens is held in each sector of each district at which material in the booklets is reviewed. Following this course, the block leaders distribute the booklets to women in their blocks, explaining their value and use. The leaders' course includes:

a. Use and care of electrical appliances; how to avoid blown fuses; how to replace fuses; how to read a meter. (55 slides are shown.)

b. Practical experience in cord repair; how to replace attachment plug caps and heater plugs; how to repair frayed cords; how to avoid cord troubles.

c. Use and care of gas appliances.

d. Home lighting; lighting in dimouts; lighting in blackouts.

Spot surveys were made in various sections of the company's territory to determine the condition of appliances and to indicate those needing repair and the type of repair required. It was found that 3.3% of the appliances are not in use and that the majority of repairs needed are to cords.

San Diego Gas & Electric has been forced to discontinue home service work because of the transportation problem involved.

Approximately 50% of the company's advertising program for 1943 will be devoted to educating the customer on appliance care and use. Thirty per cent will pertain to servicing customer equipment and 20% to explanation of government orders and available appliances.

Three government housing projects, including 4,300 units, were completed prior to December, 1941, and had reached a high percentage of occupancy about that time. Two additional projects, totaling 1,500 units, were ready for occupancy in the spring of 1942.

Several other projects initiated during the year will add approximately 3,700 residential units. Thus, while there was an unprecedented gain of 10,056 residential customers in 1941, the addition of further government projects with private building will result in almost as great an increase for the year 1942.

Increases in the commercial classification are due principally to military cantonments and bases. Aside from small army services, this increase was principally expansion of established units. A Marine Corps training center was started during 1942, however, and will add materially to next year's load.

Growth of industrial load is attributed mainly to expansion of aircraft manufacturing plants. In this classification also are several large dredging accounts, which are of a temporary nature and are being rushed ahead of normal schedule because of wartime needs.

Preparations are under way for planting large acreages of guayule in connection with synthetic rubber development and these plantings no doubt will add materially to the water pumping load in the next few years.

Loss of load through blackouts and dimouts last year is estimated at 2,660,000 kwh.

Remaining stocks of appliances at the year's end included approximately 200 ranges; 25 water heaters; 50 ironers; 500 new and 250 used cleaners; 4,000 new and 400 used radio sets; and 200 air heaters.

Of approximately 150 dealers in business in the territory on January 1, 1942, 15% had gone out of business before the end of the year, 60% had added such lines as housewares, paints, furniture and gadgets and 10% were emphasizing service. The company now employs 14 persons on sales and contact work including 2 on appliance selling, 8 on customer contact, 1 dealer contact, 1 industrial, 1 utilization and 1 home service. —*A. E. Holloway, vice-president in charge of sales.*

Southern California Edison

APPROXIMATELY 10,000 kw. were added to the company system in 1942. Loss of load through blackouts and dimouts was estimated at 2,500,000 kwh. monthly.

Adult education classes sponsored by the company last year emphasized the need for appliance care and repair. To what extent dealers can handle repairs is unknown since they cannot get parts.

As a further means of aiding with this problem the company sponsored a training school for repair men and will supplement dealer appliance servicing where it is not adequate to meet customer needs.

Approximately 60% of the 273 electric dealers in the area in January 1942 had gone out of business at the end of the year. Fifteen per cent changed to other lines and 10% added such items as furniture to supplement their electric business. Approximately 5% emphasized service work.

The company is employing 99 on sales and contact work with 10 appliance salesmen, 60 commercial and industrial salesmen, and 25 customer and 4 dealer contact people.—*R. C. McFadden, sales manager.*

Colorado

Public Service Co. of Colo.

INCREASING difficulty in obtaining merchandise for resale merchandising activities has reduced to approaching the vanishing point the services of the merchandising department as a load building activity. It has been necessary, therefore, to substitute the normal sales and load building programs with one having to do largely with maintenance of present loads. The ability to do this depends largely on the proper care and maintenance of appliances and equipment currently connected to the company's lines. Our program, therefore, involves greater customer contact than heretofore.

We are systematically canvassing our customers and instructing them in the proper care of appliances, making minor adjustments on the premises, when possible, suggesting repairs when necessary, with the thought of prolonging as long as possible the life of all electrical appliances currently in use.

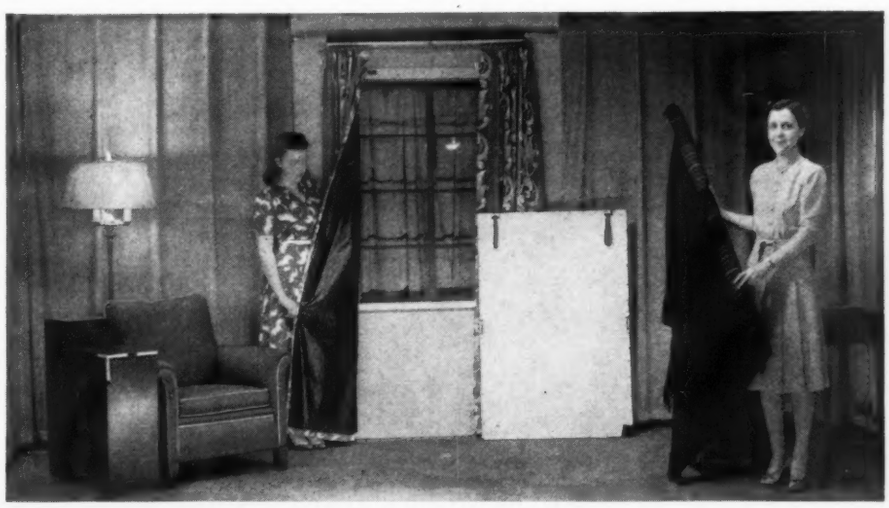
In addition we are endeavoring to develop more satisfactory dealer and other group relations by working and cooperating with them whenever possible, suggesting merchandise which may be available to them in replacement of their usual appliance and equipment lines.

Merchandise of the company in stock remaining at the year's end numbered possibly some 115 new, 11 used ranges; 17 new, one used water heaters; 2 washers; 15 new and 2 used ironers; 5 new and 9 used cleaners; 2 radio sets; 339 IES lamps.

There had been 125 dealers, approximately, in the territory in Jan. 1942, but about 60% have gone out of business, 5% changed to other lines, 2% added other merchandise such as furniture, novelties, hardware; 10% have specialized on service and 5% have taken on other services to survive.

Customer appliance repair promotion was carried on through advertising and planning conferences through the Rocky Mountain Electrical League. Possibly in 1943 schools for training of service men will be carried farther. Dealers now lack manpower to handle the volume of repair business. We hope to draw on youngsters, women, and those unfit for war service. The program will be carried on by the Rocky Mountain Electrical League.

In 1942 our advertising stressed care and maintenance of appliances, conservation of tires and rubber, explanations as to why copper and other materials are not available for appliance manufacture, promotion of war bonds, institutional copy, cooperative advertising of such war programs as Red Cross blood donations, first aid, civilian defense, USO. Home service has included a monthly distribution to all domestic customers of the *Home and Community* service pamphlets and the holding of instructional programs at the Electric Institute.



Public Service Co. of Colorado used this set to show how to black out a home at sessions held for women's clubs, OCD officials and company employees. In the picture are Elizabeth Rece, director of the Electric Institute, and Blanche Buck

We have had 30 men on door to door customer contact and surveys, 2 on dealer contact, 13 on commercial and industrial, 43 on utilization and 6 women on home service.

Number of customers and load changes have been given in the customary classification of accounts. In addition to the commercial customers given in the table, (the metered customers) we have 500 flat rate customers. There was a decrease of 36 of these accounts, and a decrease of 90.-894 kwh. for this classification. In general all other classifications showed an increase, totaling 89,445,284 kwh., of which 3,747,927 was residential, 224,547 rural, 8.271,387 commercial metered, 71,933,806 power, 616,523 other public authorities, 4,530,847 wholesale and 122.247 street lighting.

There have been no essential changes in the type of load except that since the beginning of the war there have been added many war plants and army encampments. The company serves a large metal mining area which has been adversely affected by the curtailment of production by the WPB of those metals not essential to the war.—*G. B. Buck, vice-president and general commercial manager.*

Southern Colorado Power

PUBLIC response to company promotion on appliance repair has been good. All repair shops in the area are feeling the effects of the manpower shortage and Southern Colorado Power is cooperating with state vocational training schools in preparing women and boys to do this work.

Selling promotion in 1942 took the theme, *Buy War Bonds Now, Appliances Later.* Customer contact work consisted of nutrition helps and assistance with home planning for the future.

There were 25 dealers in the Pueblo district on January 1, 1942. During the year 5% of these dealers went out of business, 90% added other lines such as paint, wall paper, furniture, records and music; and 25% emphasized service. Approximately one-third of them found means of survival in contracting for war construction.

At the close of 1942 it was estimated that there remained in stock 50 ranges, 35 water heaters and 40 IES lamps.

The company is employing two on appliance selling and one each on customer contact, dealer contact, commercial and industrial sales and utilization.

One of a series of institutional advertisements in which Idaho Power Co. traces the history and achievements of the American system of free enterprise

"To Provide for the Common Defense ...to Promote the General Welfare"
Corner-stone, for 155 Successful Years, of the Free American System
Look, Americans!
IDAHO POWER COMPANY
Keep his America—AMERICAN!

Idaho

Idaho Power

APPROXIMATELY 60% of the advertising of Idaho Power Co. for 1943 will be institutional; the remainder devoted to customer information on equipment maintenance and lighting. The total will be about the same as in 1942. Very little space was used on appliance repair in 1942 but in 1943 all promotional advertising and personal contacts will be directed toward maintenance and repair of present equipment.

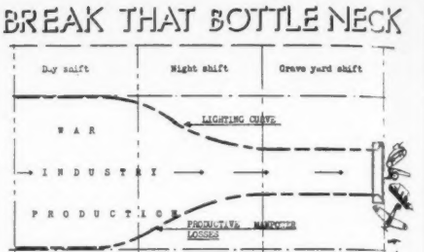
There were 325 dealers in the territory in January 1942, of which 5% have gone out of business, 50% added other lines, chiefly furniture and gifts. Only 10% have emphasized service. It is estimated that about 25% of the customer demand for service can be met by dealers and that the company's service department will have to meet the remainder.

Sales staff has been converted to dealer contact 1 man, utilization 21, home service 6, and commercial and industrial 6.—*Ralph E. Gale, general sales manager.*

Nevada

Elko Lamoille Power

THE Elko Lamoille Power Co., as its name implies, of Elko and Lamoille, Nev., felt a loss of customers during the past year. No records as to the exact loss of load were available nor were records of dealer sales, the company doing no merchandising. There were five dealers in the territory in January 1943. Service and repair seemed to be adequate for the company maintains a service shop as well as dealers. Newspaper advertising of institutional and educational and dealer help type will be carried on in 1943.—*Allen G. McBride, president and general manager.*



Finding that the lighting curve on day, night and graveyard shifts in war industry production and the curve of productive manpower losses when placed side by side roughly defined a "bottleneck," Gilbert Trosper, lighting sales engineer of Pacific Gas and Electric Co., San Francisco Division, developed the idea into the diagram illustrated herewith. It was used in a 4-page lithographed pamphlet sent by the utility to industrial customers of that division

Sierra Pacific Power

DESPITE the fact that we have lost 36 dealers out of our original 65, due to the war, the Reno plan produced a major unit sale to nearly 10% of our residential customers during 1942. We will carry on with the plan during 1943, placing all our efforts on the maintenance and repair of existing electrical appliances.

A good number of our dealers in outlying districts were engaged in other lines before they took over the sale of electrical appliances. They are still in business but their stock of appliances is dwindling rapidly with no chance of obtaining additional supply. We still consider them to be in business and the number reported gone out of business actually have closed up. All other dealers and contractors are trying to render the best possible repair and maintenance service.

Our outside agents contact both dealers and customers. There are 18 thus doing this work; 4 on utilization work, 1 home service.

Government orders closing the operation of gold mines are expected to decrease this company's sales to mining customers 7½ million kwh. during 1943. However certain new mines producing strategic metals are expected to be added to the lines during the year. Load at a new army air base will be between 300 and 500 kw.

We have done extensive advertising on the maintenance and repair of existing appliances using the signature, "Call your electrical dealer." Public response and dealer response too have been splendid. Dealers are seemingly able to handle the demand for repairs when they can get parts.

Advertising for 1943 will be educational and use dealer help copy, as well as copy aimed to assist the war effort.—*A. L. Pierce, new business dept.*

New Mexico

Deming Ice & Electric

WEEKLY advertising in both local papers on institutional, educational and dealer help subjects, will be continued in 1943 by Deming Ice & Electric Co. in much the same way that was done in 1942. There were three dealers, not including two hardware stores carrying table appliances, in the territory in January 1942 but only one remains. Three ranges, one sold by the company, two by dealers, were sold last year. No other records of merchandise are kept.

Figures in the table for rural customers are for irrigation customers only. An advance flying base is being established nearby which will add to the load in 1943 although loads in all classes increased from 11 to 40% in 1942.—*B. W. Fields, sales manager.*

Oregon

California Oregon Power

AT the beginning of January 1942 there were 72 dealers selling electrical appliances in the territory of California Oregon Power Co. and of these 17% have gone out of business during the year. Half of them have changed to other lines, about 17% have added other lines, principally hardware, furniture and household equipment. About 30% have placed renewed emphasis on service and repair.

The entire area appears adequately served as to repairs. Should there later be any breakdown in dealer activity the company may assume the work. It carried on radio and newspaper advertising on the subject although there was nothing outstanding in promotion or advertising in 1942. Institutional advertising, particularly during the last half of the year, engaged most of the attention. Institutional and educational advertising is all that is contemplated for 1943.

Stocks of ranges are down to 87 new, 28 used; 2 refrigerators, 60 air heaters and 400 IES lamps. There are eight on the sales staff on sales, customer contact, dealer contact and commercial and industrial.—*A. S. Cummins, president.*

Eastern Oregon L & P

DISCONTINUANCE of gold mining caused the loss of load to Eastern Oregon Light & Power Co. in 1942. There was no change in its agricultural or municipal power and as it is outside the dimout area, it suffered no loss from that cause.

Dealer's stocks of appliances are cleared out, with but a small stock of IES lamps remaining. Of the ten dealers at the beginning of 1942 six have gone out of business and two have added furniture and hardware.

Only promotion in 1942 was advertising. None as yet has been done on appliance repair. Two part time employees now attend to the contact, commercial and industrial and home service responsibility.—*L. G. Gray, manager, Baker division.*

Eugene Water Board

SATURATION of electric ranges in the territory of the Eugene Water Board, Eugene, Ore., is 56%, of water heaters 25% and the average annual kilowatt-hour consumption the highest in the West—2,900 kwh. The latter is an increase of 148 for the year over the 1941 average of 2,752 kwh.

This utility gathers no statistics from dealers, has no new business department and does no merchandising. Of the 20 dealers in Eugene in January 1942 about 10% have gone out of business. About 40% of them have placed emphasis on service. This utility's cooperation with dealers is to advertise once weekly in the local paper and the financing of appliances through EFHA.—*J. W. McArthur, general superintendent.*

Mountain States Power

NOTHING outstanding. We are just sawing wood and hoping to retain as much business as possible. Our greatest concern is not so much the present dealer situation but the loss of business due to people leaving the small towns and rural areas for the large industrial centers. Also the dimouts cause a dip in our business in Oregon.

Dealers in the appliance and service business are certainly as good as can be expected under present conditions. To date no one in our properties is suffering from lack of service. We of course expect to have a considerable change in the dealer set-ups in 1943 and we believe that with these changes bound to come and the many other factors which concern our business, it will behoove us to do our best to establish a good service program for our customers. Also it will be well to have a utilization program directed to our customers to help them get the most from what they have for the duration.

Possibly 10% of our dealers are out of business. It is to be remembered that practically all of our dealers selling electrical merchandise were combination dealers—electric with furniture or hardware. About 30% of them are emphasizing service. Stocks are practically gone.

The company has maintained service departments and promoted the repair business where dealers left business and will continue a utilization program for 1943. Where they are equipped dealers are 100% for cooperation with the program. There is some question whether they can handle the demand as they are having trouble with manpower. We may later have to train older men and girls.

Records of appliance sales are not complete for dealers have not reported for several months and we did not feel the reports of 1942 sales warranted the time to get them. Our district managers now take care of what is needed in service and sales information for all our sales personnel has gone to war.

Two air fields, a small shipyard, several lumber plants and a good many small war industries have been increases in business.—*H. E. Farris, new business manager.*

Northwestern Electric

DURING 1942 we carried an extensive series of newspaper appliance repair advertisements. These stressed the utility of these appliances and gave important rules for keeping them in good condition for the duration. This series has covered all the appliances, major and minor. In them we have stressed the importance of taking appliances to the local appliance dealer immediately they are in need of repair.

We have furnished two types of posters for dealer use in their display rooms and windows, advising the customer to take care of his appliances, and if necessary, that the dealer is in a position to repair them.

Many dealers report a constant increase in appliance repair business. Some have so many appliances to repair that they are way behind in their schedule. Lack of personnel has not been the chief difficulty. The principal problem is that of getting appliance repair parts. Appliances badly in need of repair have not been a problem to any degree as yet. We have made no plans to supplement dealer appliance service.

Now in our employ are one dealer

contact man, one on utilization, one on home service, three on commercial and industrial. With limited personnel customer contact work, except in home service work, has been done only in a very limited way.

The figures for residential customers in the table are given in terms of a new basis of counting customers and include rural with straight domestic or residence customers for 1942.

Our advertising program for 1943 will be devoted principally to institutional and educational messages. We will continue numerous helps and suggestions to the appliance dealers and electrical contractors through *Northwestern Dealer News*. *Northwestern Farm News*, which goes to all our farm customers is to be continued in 1943, using it as a means of helping the farmer with many problems in connection with electrical service and general farming.

Of the 225 dealers in the territory in January 1942, about 10% have gone out of business. 15% have added other lines, principally furniture. — *J. C. Plankinton, assistant general manager.*

Pacific Power & Light

IN the preparation of our budget for 1943 we eliminated practically all the details applicable to sales activities such as previously reported in such annual reviews as this. On Sept. 1, 1941 Pacific Power & Light Co. discontinued the direct sale of major appliances but continued in the merchandise field with the sale of lamps, lighting and small appliances. When this change in policy was announced it resulted in a substantial curtailment of our outside sales staff which was further curtailed after Dec. 7 because of our inability to provide adequate transportation for outside representatives. This included our rural salesmen as well as our home service advisors. In addition to this natural trend we suffered further losses through military enlistments which were particularly noticeable in the ranks of our commercial salesmen with engineering training.

There recently have been resignations within the ranks of our district sales supervisors so that we are now operating on a curtailed basis with a skeleton crew. To do this it has been necessary to eliminate all unnecessary routine unless we feel that it contributes directly to the war effort.

This policy has dominated our activities to such an extent that we have prepared a simplified budget for 1943 without estimating unit sales of appliances by dealers to determine the possible effect on revenues such sales might have. In other words, we have decided that because of the war the trends in 1943 will be largely unpredictable.

Our customer count is now made in compliance with the FPC ruling on the basis of meter count which, of course, is wholly unsatisfactory as a means of measuring progress compared with previous years. This change in classification likewise adversely affects kwh. statistics.

We are hopeful that 1943 may take us a long way on the road to clear up some of the maladjustments which have been created as a result of the war.—*D. B. Leonard, commercial manager.*

Portland General Electric

IN spite of all the restrictions, up until about October the sale of major appliances, particularly electric ranges and water heaters, was almost on a parity with the year 1940, because the dealers in our territory had stocked up heavily while they were able to do so. As additional WPB restrictions within the last two months of the year came along sales were reduced greatly and of course, too, stocks are now reduced.

An estimate of stocks remaining at the end of the year in the entire territory was that perhaps 1,200 new and 100 used ranges, 200 new water heaters, 300 used washers, 200 new ironers, 1,500 new and 1,000 used cleaners, 6,000 new and 1,000 used radios, 250 new air heaters and 10,000 IES lamps remained.

As a sidelight, in spite of dimout restrictions our system peak in 1942 was the highest in our history, being for one hour sustained 202,000 kw., which occurred four different times in December. Our January 1943 highest hour sustained peak has exceeded the system peak for December 1942.

Our sales department is now the utilization department and, due to enlistments and commissions in the Army and Navy, it is 40% smaller than it was a year ago. Our principal objective this year will be to render every utilization assistance, particularly to customers having direct contracts or subcontracts for war production.

Our own staff now consists only of five men on dealer contact part time only, eight on commercial and industrial and utilization, three people on home service.

Dealers in major appliances numbered about 160 in January 1942, of which 30% have gone out of business. Before the year is over all the remainder will be out of major appliance business but 90% will still be in business, with other merchandise carrying them. Furniture has been the usual line added.

The principal program of 1942 was one of utilization, working chiefly among industrial customers taking on war production. The changes in our territory during 1942 have been the conversion of industrial plants of various types to war work and a tremendous increase in kilowatt-hour sales to such plants. We believe we will have hit an average of 1,950 kwh. per domestic customer for the past year, an average increase of 252 kwh. over 1941. We expect, however, that this average will decline during 1943 because of the very large number of defense housing units now being and which will be connected. In these the only use of electric energy will be for lighting and a few small appliances, as no major appliances will be available.—*A. C. McMicken, general sales manager.*

Utah

Utah Power & Light

CONTINUATION of our 1942 policy will be the order in 1943. In our advertising it means stressing the care and use of appliances, proper nutrition under the educational classification, and in institutional advertising the economic and proper use of electricity for health building in the home for prosecution of the war in industry.

In 1942 promotions were in connection with the Red Cross and other agencies, to teach proper nutrition. In addition appliance repair classes were held in the high schools and colleges.

Finding a serious manpower shortage for appliance service, in cooperation with the Electrical League of Utah and the adult education departments of the schools, an 11-week course in appliance service work for men and women was instituted. Prior to that dealer and utility servicemen's schools were held in all parts of our territory in cooperation with jobber and factory representatives. It is planned to continue such work in 1943.

The public, we find, is very much service minded. Appliance service stations report all the business they can handle. About 20% of the dealers are participating in the service program. Of the 699 dealers in our territory in January 1942, about 18% have gone out of business and all the remainder have added other lines, such as furniture, paint, linoleum.

So far dealers are doing very well in handling service work. The utility is doing servicing work too wherever dealer service is not adequate. We now employ in the sales department 15 customer contact, 7 dealer contact, 10 home service and 13 commercial and industrial people. The company discontinued all merchandising on July 1, 1942.

In some instances the figures in the tables are combined residential and farm classifications because of a change

in accounting procedure which makes only this total figure available.

Stocks of merchandise remaining at the year's end were negligible. There were approximately 500 new and used ranges, 100 new and used water heaters, very few radios, a fair stock of IES lamps, but nothing else.

—W. A. Huckins, sales manager.

Washington

Puget Sound Power & Light

ALTHOUGH exact figures on load changes are not available, Puget Sound's system peak apparently had swung to daytime at the close of 1942, with an increase of approximately 55,000 kw. in daytime load as compared with the previous year.

The company now employs 68 people on its sales staff: 1 on appliance selling, 5 on dealer contact work, 18 commercial and industrial, 25 on utilization work, 10 on home service and 9 farm service men.

On January 1, 1942, there were 495 dealers in the territory. Of these approximately 40% have gone out of business; 2% have changed to other lines; 8% have added new lines, chiefly kitchenware; 10% have emphasized service; and 40% have gone into war industries.

Puget Sound plans to continue its appliance repair promotion in 1943. In 1942 the company ran a series of five ads on appliance repair in all newspapers in its territory, and home service consultants devoted five minutes of every meeting to care and repair of customer appliances. The company does not service small appliances, and is doing nothing now to supplement dealer servicing since there is no indication that this is not adequate.

Advertising during the year was directed to the war effort. Home service work took the form of nutrition classes in the company's Victory Kitchen. Except for group meetings, the company devoted little time to customer contact work.—*C. E. Hess, utilization manager.*

Seattle City Light

THE Department of Lighting, City of Seattle, has inaugurated many residence electric rate reductions in the past but none that has so greatly benefited load building as our new All-Electric rate. The All-Electric rate has created a desire by the customer to electrify the home completely and has especially encouraged the use of the automatic hot water tank. May we call special attention to our gain in ranges for the past year, 6,604. We now have 53,107 electric ranges in service on our lines. This is a very respectable percentage of our approximately 86,000 residence customers.

About 20,000 of our electric range customers use an automatic electric hot water tank and have eliminated the use of a hot water coil in the furnace. Many thousands of our other electric range customers will add automatic electric hot water heating when tanks become available again.

We can rightfully expect that bungalow courts and apartment houses built in the future will contain, in addition to electric ranges, the automatic electric hot water tank. Also the wide use of automatic electric hot water in the home will influence its use in many commercial establishments.

Some 5,000 such tanks were installed in homes last year. These tanks are of a minimum of 40-gal. size or larger, with twin heating units. In addition there were 2,700 automatic electric tank water heaters of twin unit type installed in U. S. Federal Housing projects. In the four projects in Seattle 3,568 electric ranges were also installed. One project of 868 units obtains its hot water from a central steam heating plant. Seattle's low rates for electricity were responsible for the government choosing electric ranges and water heaters.

Residence Sales Up

The residence sales for 1942 exceeded those of 1941 by 50 million kwh. Commercial power sales increased 70 million.

There were 90 electrical dealers in January 1942. With a plentiful stock of electric merchandise and other diversified lines the majority were able to carry through until the first of the year. After that the number remaining in business will be problematical. There were only about 500 electric ranges remaining in stock at the end of the year, no more water heaters.

The department has in its employ 1 on appliance sales, 16 on customer contact, 2 on dealer contact, 5 commercial and industrial, 3 on home service. The home economists continued their "Health for Victory" cooking schools in our own auditorium as well as at other social gatherings. Because of our high saturation of electric ranges and water heaters and our personnel loss into war industries and the armed services, we have not been able to assist in any way a customer appliance repair program. We believe that the solution to the problem of servicing small appliances is a responsibility of the manufacturers and their respective jobbers. Jobbers could fill this need by establishing competent service shops.

The department consistently has advertised throughout last year the advantages of the automatic electric hot water tank in the home and in business. We were much encouraged in our efforts by the contractors and builders of new homes who in almost every case installed the water heater and in addition eliminated the use of hot water coils in furnaces. The new year will bring little residential load building due to lack of the major load building appliances. We will have a substantial commercial power load increase from Federal installations.

Our advertising for 1943 will feature helpful suggestions to our customers for better service from their equipment; also the benefits the Northwest has received from public power development. Bids will be opened Jan. 21 for an addition to Ross dam. We hope they will be satisfactory so that we can proceed with the work.—*P. C. Spowart, sales manager.*

Tacoma City Light

DUE to the influx of war workers into the area, no accurate figures are available on the number of electric appliances added to the department's lines in 1942. Many ranges were bought elsewhere and shipped to Tacoma with household goods. Government freezing orders on new ranges have resulted in large numbers of used units being brought in from non-defense areas. Local stocks of ranges, water heaters and refrigerators are gone.

Estimated loss of load to the department through blackouts and dimouts is between 250,000 to 500,000 kwh. per month.

Approximately one-half of the 100 dealers in business in the territory at the beginning of 1942 had gone out of business before the year's end. Forty per cent had supplemented their lines with furniture, housewares, toys and rugs; 10% were promoting service work.

Department promotion during 1942 urged the purchase of War Bonds as a means of buying electric appliances after the war. Free booklets were distributed on care of electric appliances, and radio and newspaper promotion carried the same theme. The department is training apprentices as a means of relieving the shortage of service personnel, and is servicing and repairing all makes of ranges to supplement dealer service work.

No institutional advertising is scheduled for 1943. Promotion will center on educating customers in the care of electric appliances.

The department's sales staff includes seven persons, two on home service work and one each handling appliance selling, customer contact, dealer contact, commercial and industrial, and utilization.

Advertising Has

Wouldn't it be Awful if the iron broke down!
PUT the "heat" on that formal, Sis, because you're holding up a dance, Junior's party and Bud's new "date". Just take a quick glance at the simple short-cuts listed below and you'll be able to whip your ironing through ... and more easily too! But don't ever let anyone kid you about that iron breaking down. It's been through a worse crisses than this and will go through many more . . . if you'll give your electric iron the simple treatment that makes up "good care".
THESE TRONING "TIPS" YOU'LL FIND ARE "PIPS"
BUY UMITED STATES WAR BONDS & STAMPS ★ EVERY PAY DAY ★
SAN DIEGO GAS & ELECTRIC COMPANY

Self Service
AIDS THE WAR EFFORT!
Please REPLACE YOUR OWN "BLOWN" FUSES
Saves YOUR TIME!
SEATTLE CITY LIGHT
OWNED AND OPERATED BY THE PEOPLE

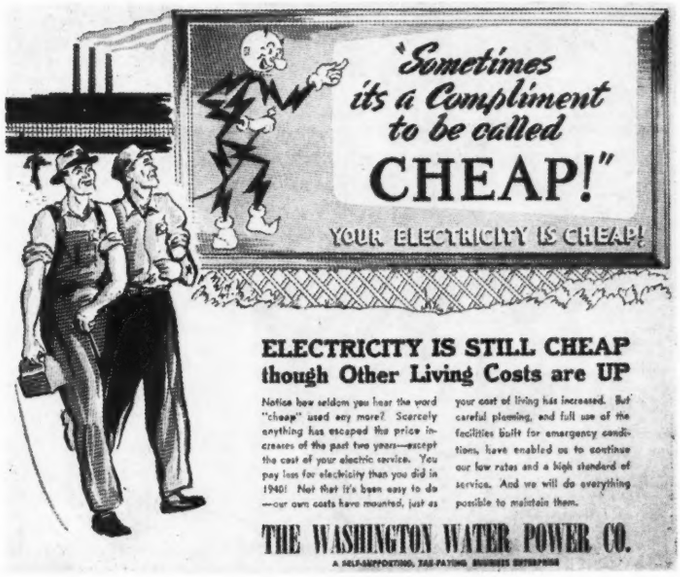
Utility ads now telling how to make electric appliances last; what to do if the fuse blows out; how to cook for health; whys and wherefores of wartime regulations. That electric rates have not followed rising price trends also is pointed out

How to make your Electrical Appliances Last Longer
FREE BOOKLET
available at all Utah Power and Light Co. offices.
WARTIME TIPS
on the Care and Use of Your Electric Appliances
UTAH POWER & LIGHT CO.

A PENNY'S WORTH OF NORTHWESTERN'S
Cheap Electricity
...makes 500 spot welds on Bomber parts at Columbia Aircraft Industries
More than 200 war industries in this region have discovered that a penny buys a lot of Northwestern Electric power to speed the production of airplanes, ships, guns and other weapons of victory. Your generous use of electricity during the past years has helped Northwestern make all electric rates low today . . . for war industries as well as for your home or your farm.
NORTHWESTERN ELECTRIC
BUY WAR BONDS

Winning the War on the Home Front
IT'S THUMBS UP FOR EVERY HOUSEWIFE!
Good Health From Food Depends On How the Food Is Cooked
Preserve the Vital Elements in Food With Waterless Cooking
Enjoy Nature's Own Wholesome Food Flavors
Two Ways to Waterless Cooking
BUY U.S. WAR BONDS
—For Service Call—
Your Electrical Dealer

A Wartime Job


"Sometimes its a Compliment to be called CHEAP!"
YOUR ELECTRICITY IS CHEAP!
ELECTRICITY IS STILL CHEAP though Other Living Costs are UP
Notice how seldom you hear the word "cheap" used any more? Scarcely anything has escaped the price increases of the past two years—except the cost of your electric service. You pay less for electricity than you did in 1940! Not that it's been easy to do—our own costs have mounted, just as your cost of living has increased. But careful planning, and full use of the facilities built for emergency conditions, have enabled us to continue our low rates and a high standard of service. And we will do everything possible to maintain them.
THE WASHINGTON WATER POWER CO.
A SELF-SUPPORTING, TAX-PAYING BUSINESS ENTERPRISE

SKY GLOW— IS AN ENEMY
New Army Lighting Order Now in Effect
HERE'S HOW TO CONTROL YOUR LIGHTS
It is the duty of every citizen to comply with the regulations of the U.S. Army Restricted Lighting Order, which is now in effect—for the duration! The restrictions are not unreasonable or burdensome. They still permit the use of lighting in stores, offices, and in the home on a controlled basis. But strict compliance with these rules must be maintained from sunset to sunrise.
Dangerous Sky Glow Must be Reduced!
WRONG RIGHT
HOMES and APARTMENTS
STORES
OFFICES
OUTDOOR LIGHTS
INDUSTRIES
THESE RULES APPLY TO THE INLAND PUGET SOUND AREA
PUGET SOUND POWER & LIGHT CO.

Uncle Sam's WARTIME Regulations
for the conservation of copper, steel and other critical materials, apply in many ways to
Electric Service Connections
Are you planning to have electric service connected to a new home?
Investigate First!
Priority restrictions govern all such connections
Investigate First
Investigate First
Investigate First
"One of my good customers went to a lot of expense on his home before he asked me about connecting electric service . . . Now he is disappointed because I am not permitted to serve his particular needs due to wartime restrictions. I wish that he had investigated first."
Bobby Kilowatt
Your Electrical Servant
PUBLIC SERVICE COMPANY OF COLORADO

Washington Water Power

IN 1943 we may promote the appliance pool idea in this territory in addition to carrying on continued emphasis on the conservation of existing appliances and the institutional idea of saving the free enterprise system. In that respect our promotions in 1942 carried this message constantly because we believe it is fundamental to survival of the American way of life.

We sold War Savings Bonds, but we backed up that sale with the advertising of the need to preserve free enterprise, and that electricity was cheap because of it. In home service we stressed nutrition, the care and use of appliances and their repair, and again the cheapness of electric service.

In our program of regular customer contact and surveys these ideas of the conservation of appliances, bond purchases, the enterprise system, were also emphasized. Surveys made an appraisal of the condition of existing appliances, suggested repair service, gave an index of possible postwar buying and indicated the need for an appliance pool.

Appliance repair was encouraged to each customer and in each group contact, supplemented by advertising and bill enclosures. Public response has been fair. Of the dealers about 20% are responding to improve facilities for service and repair. Their ability to do the work is limited and the company will continue to service appliances also.

Of the 192 dealers in the territory January 1, 1942, 13% have gone out of business, 20% have added other lines such as house furnishings, paints, cutlery and toys, 3% have gone into defense work.

Remaining stocks of appliances are estimated to number 1,000 new and 80 used ranges, 500 new water heaters, 50 new and 100 used cleaners, 2,000 new and 300 used radio sets and about 2,500 IES lamps.

Our staff in the commercial department consists of 29 customer contact, 6 dealer contact, 9 home service and 11 commercial and industrial people.—*R. B. McElroy, general sales manager.*

Wyoming

Rawlins Electric

RAWLINS Electric Co. reports load decreases in all classes from May through September last year. War has taken men away from this area for war plants and to join the armed forces. However a high octane gasoline plant is under construction in the vicinity and this employment caused some improvement in load at the close of the year. No other war industry is looked for in the territory.

BULLETIN No. 4 OCTOBER, 1942

WAR PRODUCTION SUBCONTRACTING IN THE INLAND EMPIRE

* * * * *

ARMIES and NAVIES Need ORDINARY THINGS

NUTMEG GRATERS
COTTON WIPING CLOTH
TOILET TISSUE
SOCKS
POTS AND PANS
WAX
SHOE POLISH
KNIVES
JAM AND MARMALADE
SOLDER
ICE TONGS
THERMOMETERS
SUGAR
SAND BAGS
STEEL WOOL
GALLON CANS
SHAVING BRUSHES
SOAP POWDER
BOXES
COATS
INSIGNIA
QUILTS
MOSQUITO NETTING
UNDERWEAR
DRAWER PULLS
DISINFECTORS
STENCILS
MOPS
SCISSORS
BOILER COMPOUND
WIRE
SAFETY RAZORS
OLIVE OIL
MATTRESSES
CHESTS
FEATHER PILLOWS
PLYWOOD
DRUGS
KEYS
PLIERS
GLOVES
NAILS
CARBON PAPER
DISHES
PAINT BRUSHES
BEER CONTAINERS
SCALES
FLAGS
CORNSTARCH
SPRINGS
PORCH BENCHES
PAINT
FILING CARDS
COD LIVER OIL
HATS
GOGGLES
OVERALLS
FALSE TEETH
PIPE
FUNNELS
INSTRUCTION BOOKS
LEGGINGS
COFFEE

To assist local industries to convert to war production subcontracting this monthly digest has been issued by the Washington Water Power Co., Spokane

The company now employs one dealer contact man and one commercial and industrial salesman; but has no others on its sales staff.

Of the dealers in the territory at the beginning of 1942, approximately 40% have gone out of business and 60% have changed to other lines, chiefly sporting goods and music. Approximately 60% are pushing service work.

Proper care and use of appliances were emphasized in the company's 1942 advertising program, with good response both on the part of the public and dealers. The company has taken over appliance servicing to assist dealers.

The company plans to continue its postwar planning program in cooperation with the Rocky Mountain Electrical League.

Sheridan County Electric

IN 1942, Sheridan County Electric Co. aided electric dealers with appliance repair promotion through newspaper and radio and will continue this plan with even greater emphasis in 1943. The company is prepared if necessary to service customer appliances and help dealers with their repair work. As an aid in training new people for service work the utility personnel is available for consultation by dealers.

Except for promoting appliance care and repair, the company expects to confine its advertising in 1943 to the war effort.

Seven dealers were in business in the territory in January 1942 and of these approximately 60% have gone into other fields and 15% have converted to service work. None have added supplementary lines as a means of survival.

The company is employing one person on its sales staff in utilization work. Loss of load through dimout or blackout has been negligible.—*T. W. Hughes, president and manager.*

Canada

B. C. Electric Ry., Vancouver

IN explanaton of the customers and consumption figures contained in the accompanying table it must be said of those of B. C. Electric Railway Co., Ltd., at Vancouver that the 18,200 rural customers listed include villages. The drop in number of commercial customers is explained by the conversion of many empty stores into residence suites. The annual kilowatt-hour consumption figure is computed exclusive of flat rate water heaters.

Loss of load due to dimout and blackout is estimated to be 122,950 kwh. monthly.

Personnel of the sales department consists of 17 inside and 15 outside men on both gas and electric appliances, 1 dealer contact, 3 industrial and commercial and 4 home service women.

Dealers who have gone out of business during the past year only number about 3% but many more are likely to close this year. Of those remaining 5% have changed to other lines, 40% have added other lines, mostly furniture and hardware, 75% have put more emphasis on service and repair. Those leaving have gone into war work. The utility repair department is undertaking repair service on appliances, except radios and washers, regardless of where the appliance was purchased. A charge is made for materials and labor. No promotion of repairs has been carried on in 1942.—*Edmund E. Walker, light & power sales manager.*

B. C. Electric Ry., Victoria

ADVERTISING and promotion to induce customers to keep their appliances in good repair and to avoid purchase of new appliances which are now very scarce, has been carried on by B. C. Electric Railway Co., at Victoria. So far, dealers are handling all demand for repairs and nothing further is contemplated. Generally educational and institutional advertising as exigencies dictate will be used in 1943.

Sixteen dealers were in business at the beginning of 1942. Since then one of them has gone out of business. Three have changed to other lines, chiefly

china and furniture. The utility sales staff consists of six on appliances, one customer contact, one utilization and one home service. IES lamp sales, not listed by units in the table, amounted to about $6,500 in 1942, $6,475.34 in 1941.—*M. C. Truman, manager light & power dept.*

Leagues Convert Programs Too

Find many special services to perform for the industry 'though promotions have ceased to be

GENERALLY classified as leagues, whether called bureaus or societies instead, these cooperative organizations, too, found a place in the converted commercial side of the business during this first year of war—1942. Not permitted to promote wiring for lack of copper, or appliance campaigns for lack of appliances, or lighting for reasons of both materials and dimout, many cynics jumped to the conclusion that such organizations no longer served a purpose and expected to see them die or be salted away until peace and markets returned.

Yet there are still services that can be performed for the industry and the public better and more acceptably through such a cooperative medium as a league, one with no special commercial interest, only the larger public and industry concern. It is interesting how varied these services are and how tailored to fit the specific needs of each territory in which they operate. Reports which follow are from the leagues of the West and each tells its own story.

Bureau of Radio & Appliances

TREMENDOUS changes that affected business in the first year of war called for an entirely new treatment of the promotional activities of the Bureau of Radio and Electrical Appliances of San Diego County. Likewise the challenge of undreamed of regulations, restrictions, orders and reports required of our members demanded a new kind of personal service.

With the first real threat of regulation we established and have since maintained constant contact with the War Production Board, the Office of Price Administration and later the Office of Defense Transportation. Because government agencies take no responsibility for bringing information to you individually, we have studied these orders and regulations as received and have interpreted and reissued those affecting us in understandable language. We suspect that many have found this service quite helpful.

Even though advertising technique has changed, the need for it has increased rather than diminished. Actually our Bureau advertising committee spent, from the budget made available to it by the San Diego Gas & Electric Co., a larger amount than ever for this purpose.

Whereas heretofore almost all of our emphasis had been placed behind appliance selling campaigns it was felt we should heavily stress the *care and use* theme which would automatically support the demand for whatever appliances might still be available for sale. During the year, first washers and ironers, waffle irons, refrigerators, irons, then vacuum cleaners and other appliances were taken in turn. By the end of the year a *Care and Use* manual was prepared and plans made for its distribution in cooperation with the women's division of the city's civilian defense organization. Lectures on the care and use of appliances to 50 block plan groups prepared these women to make an intelligent distribution of the booklets to women in their blocks. This program is continuing into 1943 to reach all of the block plan groups.

To assist members in respect to the government regulations an appliance forum was held in April at which some 100 appliance organizations obtained the latest information from WPB speakers. They considered best ways and means to keep businesses going and exchanged ideas. Later weekly meetings were started to study WPB and OPA orders. Digests and printed forms of such regulations were supplied to members. The bureau appealed to the state rationing board in behalf of dealers needing tire replacements and helped to establish a tire board policy favorable to service dealers. It also inaugurated a campaign to insure a source of supply of Victory ranges for dealers, presenting the case for dealers of this war production area for consideration.

San Diego Bureau ran this advertisement as a reminder that the electrical repairman, too, has his manpower problems

WANTED IMMEDIATELY
REPAIR MEN WANTED
We're All in the Same Boat!
Everyone needs more help these days
Thank You Again
Buy U.S. War Bonds and Stamps
BUREAU OF RADIO AND ELECTRICAL APPLIANCES

Manpower was soon recognized as the chief problem in connection with the servicing of appliances. Not only was the draft taking service personnel but attractive wages in the airplane industry were drawing more, and even the Manpower Commission began almost a draft of mechanics to supply army and navy post shop needs. To replace such losses first a radio service training course was started in June in cooperation with vocational schools, and now a refrigeration service training course is being started. Material for the course is being prepared now and we expect to get going not later than February 1.

Another conference was held in conjunction with the annual meeting of the bureau in November, considering the separate problems of radio, refrigeration, laundry equipment, and small appliances. Included too were authentic presentations of the manpower outlook, gasoline rationing, ODT procedures, etc. It was acclaimed the most constructive of all our meetings.

As for our 1943 plans, our board of directors held a long session on December 31 and tried valiantly to map out plans for the year but agreed that we couldn't see that far ahead. We are going ahead at once with the refrigeration service training program in connection with our vocational school.

One of our chief activities will be, of course, that of continuing our cooperation with the women's division of civilian defense in connection with the care and use manual and the appliance lectures. All 50,000 copies of the original order will probably be distributed before the end of January. We have just ordered an additional 30,000 copies printed, most of which will be used in our county communities. The lectures are being booked steadily and all indications point to a continuation of this program for several months. If and when the block plan ceases to provide assignments we will turn to other agencies.

The year 1943 is certain to be an extremely busy year for we are determined to do everything possible to help keep as many of the businesses going as we can. When the stop-manu-

facturing of appliances was decreed and one by one the all too familiar orders and regulations commenced to hit us, many felt that the average dealer couldn't last the year out. But most of the folks are still here and determined to stay in business if at all possible. Of course there have been casualties and more will come but the losses have been nothing like those the experts predicted. The reason is, all of us working together have untiringly tried to do something about it, as evidenced by a review of our 1942 activities.

Appliance stocks have been augmented with entirely new types of merchandise, service and repair operations have been expanded, and adjustment to changed conditions has been attempted by almost all of our members. This same brand of cooperation and resourcefulness must be brought into play more than ever now, for none will deny that 1943 probably will test us to the limit.—*J. Clark Chamberlain, secretary-manager.*

Pacific Coast Electrical Bureau

ALL consistent readers of ELECTRICAL WEST have been kept fully informed regarding the activities of the Pacific Coast Electrical Assn. as they have been reported regularly and in rather complete detail at the time that they have taken place. We therefore will not recount again the details of the spring conclave, the fall conference, or the twelve district meetings that were held at strategic points throughout the state. We would, however, like to report briefly upon the activities of the Pacific Coast Electrical Bureau, which is the promotional agency of the association.

Through the early months of 1942; in fact, right up to the time that private building was frozen, the active promotion of the Red Seal Adequate Wiring program continued. The plan thereby was kept alive in the minds of the builders so that it may be resumed again as soon as the restrictions have been lifted and the building program again gets under way.

Of particular importance has been the work of the Code and Ordinance Committee. Under its supervision work has gone forward on the promotion of the Uniform Electrical Code, with the result that at the present time 15 California cities have adopted the latest edition of this code. Fifty-five other cities are working under previous editions of the Uniform Code, and it is anticipated that during the coming year most of these will have been converted to the latest edition, and that a number of new cities will have been added to the list. The introduction of the WPB list of strategic materials presented a serious problem to many of the communities whose wiring regulations were in conflict with it. To meet this problem, the Code and Ordinance Committee prepared an emergency supplement to the Uniform Electrical Code which modifies local regulations to comply with WPB restrictions for the period of the war, but automatically terminates at the close of the war, and returns the city to the normal prewar regulations. As further aid to the electrical inspectors during these trying times of rapid changes, the bureau sends them, on standard file cards, all interim revisions to the National Electrical Code, and comments regarding the application of these revisions to the local situation where such further explanation is necessary.

Following the axiom "in time of war prepare for peace," the ordinance regulating the sale of substandard electrical appliances is being revised and brought up to date. Because there is a great backlog of demand for household appliances being built up during this period when they are not available, it is anticipated that as soon as the lid is lifted from manufacturing the market will be flooded with merchandise to meet this demand. To protect the public against an influx of substandard and hazardous appliances, an aggressive campaign is being developed to secure the adoption of this ordinance as widely as possible throughout the state.

At the present time there is being conducted a course in electrical appliance repairs. This was launched at the Frank Wiggins Trade School in Los Angeles as a test class to determine whether or not a sufficient number of enrollees would be secured to warrant extending the program as a means of assisting dealers in solving their problems of manpower shortage in their repair shops. The class started with an enrollment of twenty-eight which expanded to fifty the second night, at which point the enrollment was closed, as this was the maximum number which could be handled effectively in one class. The continuing interest of these original students, and the increasing confidence that they are going to furnish valuable shop material, indicates that this test course will be a success, and that there will probably be a number of other such classes held at strategic points throughout Southern California.

During 1943, all of this Code and Ordinance work will continue vigorously, not only because conditions are particularly favorable for obtaining the attention and interest of city officials, but also because the present quiescent period in construction and in electrical appliance merchandising affords a most unusual opportunity to clear up many of the conditions which have, in the past, retarded our industry in its effort to render a better, broader and safer service to the public.—*Victor W. Hartley, managing director.*

Rocky Mountain League

AN ALERT, forward-looking group of electric utilities executives from Colorado, Wyoming, New Mexico, Montana and South Dakota convened in Denver, Jan. 15-16, at the first Rocky Mountain Electrical League meeting of 1943, to consolidate plans for the new year.

Gaylord B. Buck assumed the leadership, to which he was elected last October, taking over the presidency from J. W. Alexander, whose efficient administration of RMEL's 1943 affairs makes possible the momentum achieved at the recent conference.

Already converted to a full-fledged war agency under Alexander's guidance, RMEL needed only Buck's electric touch to generate a full head of steam; and the manager-members—practically all of whom are volunteer officials in various phases of the government's war efforts—were equipped with the "savvey" to operate the rehabilitated league as a going concern in a completely new field.

For the duration, member companies will be so non-commercial that customers will hardly recognize them as the same organizations which formerly struggled with merchandising quotas and load building campaigns. Industry advertising and public relations, according to Guy W. Thomas and C. G. Henderson, chairman and associate chairman respectively of that committee, should trend toward the firmer ground of helpful service to customers, using "Reddy Kilowatt" more extensively as a friendly emissary with the common touch. The managers endorsed the committee's report, after Ashton B. Collins, inventor of the electric symbol, addressed the group, pointing out Reddy's multiple uses.

REA activities and the rumored appointment of a federal power administrator were discussed in round-robin fashion, with J. B. (Ben) French, Black Hills Power and Light Co., Rapid City, So. Dakota and L. R. (Luke) Storey, Home Gas & Electric Co., Greeley, Colo., leading. These subjects were treated on a basis of pending legislation, and in the light of frankly-expressed predictions by national REA officials that postwar operation of electric utilities by cooperative units will be the rule rather than the exception.

A policy of proceeding as usual in the matter of dimouts and electric advertising signs was adopted, following a report by Harold T. Rankin, state chairman of Colorado's blackout committee, and head of the league's technical com-

mittee dealing with the same activity. Rankin, supported by Guy W. Thomas, Public Service Co. of Colorado, pointed out that no shortage of power is indicated to warrant any voluntary economies to conserve electricity. In fact, the power situation is so well in hand, F. F. McCammon, chairman of RMEL's committee to investigate this subject, reported, that no necessity exists to pool power resources or contemplate any program for the exchange of power with other areas. Peak requirements on war industry construction and installations at military establishments are already on the wane and no predictable emergency will present a demand that cannot be met by existing facilities.

J. E. Loiseau, who heads the league surplus material distribution activity, reviewed this clearing house service, pointing out that hundreds of thousands of dollars worth of generators, transformers and other equipment had been made available to member companies, without resorting to priorities channels, thus relieving manufacturers of a serious burden.

R. H. Joyce and C. H. Newton, Jr., co-chairmen of the "Manpower in Regional Electric Industries," analyzed their recently-completed survey in six mountain states, and reported that some companies are now using women as meter testers with satisfactory results; that feminine meter readers will doubtless follow; but that, on the whole, there is prospect of relief to the shortage of skilled electrical workers (especially in the metropolitan areas) in that many experts are finishing installation jobs for the government and will soon return to private employment.

R. B. Hubbard (Public Service Co. of Colorado), Denver representative of the War Labor Board, together with W. D. Virtue, discussed the possible establishment of a WLB branch in the Rocky Mountain Region (probably Denver) and explained its functions with relation to utilities and the probable advantages to accrue.

J. W. Alexander, retiring president and member of the Postwar Planning Board, disclosed that all phases of RMEL activity were coordinating fully with his committee's program; that plans were maturing for the inevitable day when the league must again readjust its functions to absorb the terrific surplus of power released by war industries when victory is achieved and peacetime pursuits are resumed. This board, working in close collaboration with President Buck, contemplates new developments in the electrical field—such as electric house heating, television, electric water heating, electric ground heating, for agricultural and horticultural purposes, and electronics in general—as agencies to be employed.

Consistent with restrictions on travel, no date was set for the annual spring conference of the RMEL Engineering and Accounting Sections, of which O. P. Reed, Cheyenne Light and Power Co., and Harry Adler, Arvada Electric Co., are, respectively, chairmen. A "Convention in Print," patterned after ELECTRICAL WEST's example, is in contemplation, with the Denver accountants and engineers sitting as an "editorial sounding board."

George E. Lewis, Rocky Mountain Electrical League manager, and his secretary, Miss Bernadine Tarr, at a recent meeting

Fitting in nicely as a climax to the first day's deliberations, the AIEE dinner-lecture, with R. L. Witzke, Westinghouse Electric & Mfg. Co., the featured speaker, shed light on ways and means to *Make Existing Electrical Apparatus Last for the Duration.* Witzke emphasized that equipment may be safely overloaded under proper conditions, thus forestalling the need for new machinery. He warned that overheating will diminish the lifetime of apparatus and auxiliary equipment from 25 to 300 years to one-half that period of service. The lecture was accompanied by slides to illustrate permissible loading, ambient temperatures, etc., and pled for respect to generators.

A note of sadness pervaded the managers' meeting, due to the tragic death of Mrs. Roe Emery in an automobile accident. Mrs. Emery was perennial hostess at the Stanley Hotel in Estes Park on each occasion when RMEL held its annual convention there, during well-remembered days prior to rationing and manpower shortages.

Summarizing 1943 plans for Rocky Mountain Electrical League as crystallized at the managers' conference: RMEL is fully geared in all departments to all-out war effort, manned by personnel fully cognizant of the electrical industry's responsibilities to the nation, but ready, willing and eager to meet the hour when the league must instantly adjust itself again to the familiar job of finding a receptive market for power load.

"Who can remember the good old days when the fellow at the housewife's front door was trying to SELL an icebox or a washing machine, instead of buying it back?"—ESQUIRE, Feb. 1943.

Refrigerator Service

A *Simplified Training Course for Refrigerator Service Men,* written from an industry-wide standpoint, supplemented by an instructor's manual and a clever thumb-indexed book called *Trouble-Shooter's Guide* is being offered by the Kelvinator Division of Nash-Kelvinator Corp. to aid dealers in the training of new service personnel. These books cover service on electric refrigerators in general rather than the company's own product. They are simply written, short, well illustrated, pocket size.

The manual covers refrigeration principles, theory, refrigerants, types of compressors, condensers, float valves, expansion valves, temperature controls, motors, installation procedure, sealed unit systems and cabinets of the various refrigerator mechanisms. The *Trouble-Shooter's Guide* lists symptoms under two heads, those in the cabinet and those dealing with the refrigeration system.

The instructor's manual tells how to organize classes and suggests lecture outlines.

Recruits For Health

More recruits to the *Health for Victory* program were told about by Charles Meier, Westinghouse merchandise department. In Seattle the Post-Intelligencer and City Light Department is sponsoring a large class at *Highpoint,* a new housing development to serve the shipyards in that area. Anna Roosevelt Boettiger, of the Post-Intelligencer, was very prominent in the arrangements.

The program is being carried out in connection with the public schools in Los Angeles and Seattle and with the granges in Idaho. The Kaiser shipyards at Richmond has started a series of classes also.

● WHO MADE IT, a directory to smooth the path of perplexed servicemen, is being distributed to appliance dealers by the Premier Division, Electric Vacuum Cleaner Co. of Cleveland, Ohio. Listing vacuum cleaner trade names and manufacturers, the directory will answer the question of where to get needed parts for cleaners brought in for reconditioning but bearing a name unknown to the dealer.

● WHEN VACUUM CLEANERS were frozen upon order of the War Production Board, Sun Vacuum Stores, of San Diego, San Francisco, Oakland and Seattle ran display advertising apprising the public that its rebuilt vacuums were not frozen and were still on sale. Subsequent order releasing frozen vacuum cleaners in dealers' stock was also publicized.

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Worthy of an Award

IT is just too bad that there are no medals for industry accomplishment such as the Army-Navy "E" or any of the awards given to the men in the armed forces. If there were, the electrical industry here in the West certainly would qualify. For proof the editors offer this twenty-fourth annual review number with its analysis of the job the industry has done and its resume of the industry's ability to continue to perform.

If there are those who doubt that the industry has not put every human and material resource back of the war effort, let him study the record: Upwards of 15% of its manpower has gone to war, yet efficiency remains unimpaired. A one-fifth greater demand for power has been met without incident. Despite material shortages, priorities and a host of other perplexities, facilities have been ready for every demand imposed whether emergency or normal. There has been a complete transformation of sales and promotion techniques and manpower. There has been a veritable Western industrial revolution, yet all of the new plants and facilities have been wired and lighted and equipped. There have been changes and sacrifices, but these have not lessened the industry's inherent ability and purpose to do a good job. So we reiterate—the men and women who are keeping electric power geared to the war effort deserve a medal.

Prophets Confounded

JUST a few years ago there were experts testifying before Congressional committees that America had reached the age of "the mature economy." They asserted and offered exhibits to prove that the frontiers—geographic and industrial—which had given America initiative and vitality and progress were gone, that growth had slowed down to a halt, that industry was static and that private venture capital had no future.

How the war has confounded these prophets of doom! True to past history this present world-wide conflict has brought vast changes in technology, in industry, in new products and in new horizons. Only this war transcends all others because it is mechanized conflict on a huge scale. Out of the factories producing war machines, out of the research laboratories, out of the minds of engineers and scientists are coming the makings of a new American frontier that challenges the imagination. And many of the new developments and products are electrical in some form or another. What a prospect for the future! What a challenge for postwar planning.

Bucking the Trend

ALMOST without exception, everything that the American people eat or wear or drink or buy costs more today than it did a year ago. One highly important exception—electricity. U. S. Department of Labor statistics show that since the war in Europe started back in September, 1939, food prices have risen 35%. During the same period clothing has jumped 25% in cost. House-furnishings are up 21%, rent 3% and fuel and ice 18%. The overall cost of living index has climbed 15%, which means that the housewife must spend $6 to get what she formerly purchased for $5. Yet in this same period the cost of electricity has decreased 2%.

While this decrease may be small, the important point is that the price has gone down in line with the steady trend that started back in 1919. This is a fact well worth impressing upon the public during the inflationary period which seems to have encompassed everything else in the American economy. There have been a few advertisements pointing out to the public that electricity still continues to cost less. But there have not been enough.

The Wrong Appeal

IT is the wrong approach to Americans. Either it is a prohibition hangover or it is school professor technique. Whatever it stems from, a reformer complex in the administration or a schoolmaster preponderance in high places, it is just plain poor psychology. The despised salesmen

could teach them much better how to sell America its necessary restrictions.

Americans can be sold anything, but they do not like to be ordered around like a lot of sheep. That may be acceptable to browbeaten Europe or servile slave Japan. But if the government of the people and by the people wants the people to tighten their belts and deprive themselves, these people will have to be sold the reason; the appeals must be right.

Salesmanship, despised by the professors and bureaucrats, is still doing the best job of selling America to sacrifice and to keep striving. The restrictive agencies would do much better to turn it all over to this private initiative. Certainly the fine print legalistic orders that pour from the fevered brain-trusters in overcrowded Washington couldn't sell anyone even the idea of reading them.

Yet the splendid advertisements prepared by the master salesmen and advertising agencies which appear in all of today's publications—sponsored by private industries—are selling Americans the idea of supporting the war, of self-sacrifice and of harder work for victory. They even sell Americans on taking these unpopular restrictions and orders as one of the horrors of war to be borne patiently.

Then why not put more of the sales appeal, the right psychological approach to all of it? Americans can be sold, not told.

Colossal Ignorance

HOW little everyone really knows! It is not that censorship deprives us of fact. Rather it is that we seldom try to learn the details about other than our own immediate interests. The dislocations of war reveal this colossal ignorance pitilessly.

Behold the bright young men with which the bureaus and departments of government are loaded. How the war reveals, even more dramatically than their New Deal acts did prior to actual war, their limited knowledge of the facts of life! They knew nothing but the scandal about the very businesses whose profit system enabled their fathers to put them through economics, political science or law at college. When they run up against the details of business they flounder. It doesn't work at all as the economics' texts predicted.

Behold the draft boards of local citizenry who reveal by their acts that they know almost nothing concerning what others do for a living. Certainly they have no appreciation of the relative importance of various kinds of work. For they draft valuable men from vital but sometimes obscure industries and defer more obvious slackers. They seem to think that food products come from cans, not that they must first be sown or bred, raised or nurtured, and harvested or slaughtered before reaching a can. Consider the tire boards who display such ignorance about the functions of farming or even of machinery sales engineers and deny them gasoline to get around in their vital procurement work for war plants.

Long have the utilities suffered from the ignorance and indifference of the public as to its complex difficulties. But now all business finds itself hamstrung because of a similar ignorance of its methods and complexities. The regulations and prohibitions placed upon business, in the honest enough endeavor of the schooled but inexperienced lawyers of OPA and WPB, more often seem to come from a book than out of life and reality. And the administration seems to pick those with the least experience for the most important posts.

Of course business life is a complicated web and, perhaps, to expect each school child to learn how it all works is too ambitious. But one suspects that what is taught about it is the regrettable politics and intrigue of the empire-building days of its past, not the fundamental groundwork which makes business work at its every-day job of supplying human needs. Less dramatic than scandal, to be sure, is straight cost accounting or simple management. But how much more useful it would be —not only in peacetime, but especially during war when this complex machinery must be adjusted to new functions.

The cost of ignorance is high. It is paid in waste of priceless time and critical material, to say nothing of home front morale.

WE cannot win a war simply by equaling or even outproducing our enemies. We must have a smashing superiority and keep it that way to the end. And we must remember that we cannot win by production alone. Victory will be won on the fields of bloody battle—by our soldiers, sailors and marines—the best and bravest fighting men in the world. So I give you this solemn thought: The cost of keeping our freedom will be measured not in money, in time or production, but in American lives. The boys who are fighting our battles will win more quickly and with less loss of life if the men on the production front give them every possible advantage in combat weapons—if we accept willingly and quickly the changes in our lives that make such production possible. Keep this thought burning in your minds and hearts: That countless lives and untold suffering will be saved if extra effort at home brings victory just one month closer. The grimmest fighting and the hardest work lie ahead of us.
—Donald M. Nelson, chairman, WPB.

EMEA *Dope Sheet* — *Edited by Howard C. Park*
EMEA of So. Calif.

Electrical Insulation—Weakest Link

INSULATION is the weakest link in the proper operation of most—if not all—types of electrical equipment.

Insulating Materials

Various materials found in nature, and combinations of them, are used as insulators of electric current. Some of the more common insulating materials are: porcelain, glass, mica, rubber, cotton, silk, paper, wood, resinous products, etc.

Destructive Forces

In service, the insulation of electrical apparatus and equipment is subjected to the effects of: moisture, temperature, vibration, air, oil, dirt, chemical action and many other destructive forces.

Electrical Properties

The fundamental electrical properties of insulating materials are:

1. *Dielectric Strength*—resistance to breakdown under static or high-voltage stress.
2. *Insulation Resistance*—resistance to passage of current.

Dielectric Strength

As ordinarily conceived, dielectric strength is expressed in terms of voltage. Thus the dielectric strength of any given insulating material is the voltage at which it is punctured or fails due to static stress. It is not affected by the area of the insulating material but does increase with increased thickness.

There is no practical way by which the ordinary high-potential test can indicate defective insulation without causing failure.

Electrical equipment and apparatus are manufactured with insulation sufficiently strong to withstand high-voltage or dielectric strength tests as directed by the AIEE rules; however, these tests are preceded and followed by insulation resistance tests.

Field Voltage Tests

Dielectric tests impose a severe stress on the insulation and if applied frequently may cause or hasten breakdown.

If a high-voltage test is to be made on a piece of electrical equipment in the shop or plant, the original dielectric-test to which the equipment was subjected by the manufacturer should first be procured.

Acceptance tests should not be in excess of 75% of the factory a-c tests. Old rebuilt apparatus or equipment whose original insulation has not been disturbed should not be subjected to a-c tests greater than 75%, preferably 65%, of factory a-c tests. If tests are frequently repeated they should not exceed 65% of factory tests.

Insulation Resistance

This is expressed in *ohms* or *megohms*. The resistance of insulating material is directly proportional to its thickness and inversely proportional to its area. Thus a given piece of insulating material may have a resistance of 10 megohms. If the thickness of the material is doubled the resistance would then be 20 megohms. If the area is increased to ten times the original size the resistance would be one tenth as great or one megohm.

Insulation resistance is determined by d-c tests. The *megger*, with direct reading ohms or megohms scale, is the instrument used to determine insulation resistance. Meggers are manufactured in three different sizes with voltage values of 500, 1,000, or 2,500 volt. A-c tests are not used as the a-c may be short-circuited by capacitance or choked by inductance.

There are no given rules for *exact values* of insulation resistance. It is not a stable quantity like current and voltage. Like pieces of insulating materials or electrical equipment may vary greatly in their insulation resistance values due to moisture, temperature, surface leakage and other conditions. However, minimum safe operating values are well established to indicate weak insulation conditions. Indications of insulation conditions should be determined by comparative tests taken on the individual circuit or apparatus at various intervals.

Indications of Insulation Resistance Condition

The insulation resistance value at any given time, except readings which exceed minimum allowed values, is not of prime importance except to serve as a comparison factor with previous tests to indicate insulation resistance conditions. Comparison of present reading to previous readings may show:

1. Insulation resistance so low that operation is unsafe and something must be done to raise the low resistance.
2. Insulation resistance low but well maintained. Apparatus is probably all right for operation, but an effort should be made to locate and remedy the cause.
3. Insulation resistance of fair or high value and well maintained. Apparatus should give little cause for worry.
4. Insulation resistance of fair or high value and previously well maintained but showing a sudden lowering in resistance. When this occurs, the equipment should be watched carefully, and insulation resistance tests made at short intervals until the cause of the lowered value is located and remedied, or the resistance becomes steady at a lower value safe for operation, or reaches so low a value that the equipment is unfit to be kept in service.
5. Insulation resistance of fair or high value, but showing a constant tendency toward lower values. An effort should be made to locate and remedy the cause and check the downward tendency.

Minimum Insulation Resistance Values

The commonly accepted minimum value is one megohm per 1,000 volt rating of the apparatus tested.

The AIEE and ASA standard for minimum insulation resistance values of rotating electrical machinery when tested at 75° C. and in a clean dry condition:

$$\text{Insulation resistance in megohms} = \frac{\text{voltage}}{\text{KVA} + 1000} + 100$$

For completely installed wiring systems the minimum insulation resistance values recommended by the National Electric Code 1940, article 300, paragraph 3018:

1. For circuits of No. 14 or No. 12 wire..... 1,000,000 ohms.
   For circuits of No. 10 or larger wire:
   - 25 to 50 amp. inc... 250,000 ohms.
   - 51 to 100 amp. inc... 100,000 ohms.
   - 101 to 200 amp. inc... 50,000 ohms.
   - 201 to 400 amp. inc... 25,000 ohms.
   - 401 to 800 amp. inc... 12,000 ohms.
   - Over 800 amp..... 5,000 ohms.
2. The foregoing values shall be determined with all switchboards, panelboards, cutouts, switches, and overcurrent devices in place.
3. If lampholders, receptacles, fixtures or appliances are also connected, the minimum resistance required for branch circuits supplying same shall be one-half the values specified in paragrah one.
4. Where climatic conditions are such that the wiring or equipment is exposed to excessive humidity, it may be necessary to modify the foregoing provisions.

Periodic tests to determine the condition of insulation resistance in electrical systems and equipment are indispensable guides for the electrical maintenance engineer to assist him in locating insulation weakness before failure occurs.

WPB and OPA

New rulings and changes of the month summarized

THE supply of copper is not adequate and never will be while this war is on. So said H. O. King, director of the WPB copper division on Jan. 8. False hopes that the copper situation might ease with the decline of new construction for camps and war factories were thus set at rest.

But if copper is scarce, rubber is scarcer, and from now on wiring is expected to be done in knob and tube except where subject to mechanical injury or located in hazardous atmospheres, with wire that has no rubber for its insulation.

The conduit restricting order L-225 prohibits use of conduit, flexible conduit or thin wall tubing except under the above conditions. Sales or deliveries are prohibited except on ratings of A-1-j or better. Manufacturers are not to produce more than 40% of their 1941 production.

Contractors having conduit in stock may use it up but cannot replace it. Inspectors are concerned as to whether conduit at least may be used for the service run, as required in most of their ordinances. There are other complications. Knob and tube wiring for heavy cables in industrial plants introduces the difficulty of supporting such cable satisfactorily or safely.

Under the revised rubber control orders M-15-b and b-1 no wire with rubber for insulation is to be manufactured for use in knob and tube wiring systems. While this, too, does not affect wire in contractors' stocks it imposes another accounting problem on both manufacturers and wholesalers to certify each lot of wire sold as to its use.

Motors and generators cannot be sold now by either manufacturers or dealers on orders rated lower than AA-5, under an amendment to L-221.

Fuses too now require an A-1-j or better rating to purchase from manufacturer. An amendment to L-161, set Jan. 21 as the last date at which A-10 orders would be honored. The amendment purports not to affect retail sales to all consumers. Purpose of the order, it is stated, is to place fuses under more effective control at the wholesale levels.

Three more wholesalers in the West were denied priority assistance for periods ranging from three to six months for filling and accepting unrated orders for wire and for misuse of P-100 and its A-10 rating in making deliveries of supplies which were not used for maintenance and repairs or operations. These were the Osipow Electric Supply Co. and National Wholesale Electric Co., both of Los Angeles, and Arizona Wholesale Electric Co. of Phoenix.

Emergency repair and maintenance in the field should be considerably speeded up by the decentralization of authority to grant higher preference ratings from any of WPB's 110 district offices. They can grant up to and including AA-2x.

Manpower for repair and hand trade services was certified as essential to the support of the war effort by the War Manpower Commission. Among the listings sent to local boards in release No. 115 as amended are: repair of elevators, radios, refrigerators, clocks, stoves, electric appliances and motors, farm equipment, armature rewinding, electric installations in domestic, commercial and industrial buildings.

Motor repair shops, because of their importance to war production, have been classified by WPB with manufacturers of Class B-II products under the controlled materials plan and will receive all the rights and privileges of CMP. Such shops, according to the National Industrial Service Assn., will be sent form CMP-4b if they are operating under PRP. Those who instead have been extending their customers' priorities are advised to write WPB (D. M. Crim, chief, repair and general services section, 1014 5th St., Washington, D. C.), and ask to be put under CMP for the second quarter.

Not only the controlled materials—aluminum, copper and steel—but all other materials required in the repair and maintenance business will then come under the allotment number assigned under CMP and others may have difficulty getting other than just what may be left. Materials for resale, construction or plant improvement do not come under CMP however.

War housing projects programmed by the National Housing Authority were automatically uprated to an AA-3 where P-55 orders have been issued a builder or P-19-d and h. This applies alike to privately or publicy financed housing, new or conversion, permanent or temporary housing.

Use of PD-1-x form by distributors for other than previously permitted supplies has been granted by the industrial and hardware supplies branch. It now applies to such materials as construction equipment, drawing supplies, health supplies, janitor supplies, paints, photo supplies, blueprinting equipment, radio tubes and parts, refrigerator parts, safety equipment, washing machine parts.

Radio tube replacement sales soon will require the turning in of old tubes when new are bought. This will permit salvaging of tube bases and other parts. Further curtailments in tube types will also be made. (Originally there were 700, now only 375. A further reduction of 120 is contemplated.)

Vacuum cleaners that are sold as rebuilt will be required by OPA to conform to 14 performance and rebuilding standards in order to qualify for the maximum prices allowed for rebuilt machines. A list of specific dollar and cents prices for every model and make is contained in the order, in similar manner to the refrigerator order. A rebuilt machine must also carry a one-year guarantee, be conspicuously labeled. A minimum trade-in value, too, is set up for machines taken in trade. The regulation (part 1370 of MPR 294), also establishes specific dollar and cents prices for "as is" machines.

Voluntary pooling programs of utilities, pioneered in the West, are to be superseded and absorbed by a new formal utility redistribution program to be set up by WPB's power division. This will be an inventory control section, and Charles E. Kohlhepp, vice-president of Wisconsin Public Service Co., has been appointed to head it, beginning Jan. 5. Purpose will be a continuing inventory record of utility material available for transfer from companies now holding it in excess of P-46 limits to utilities and war plants needing it.

Records are to be kept on a regional basis, using established WPB regions. Order P-46 will be revised to require utilities first to obtain needed maintenance and construction metals through these regional offices before using priorities to get new stocks. The voluntary groups of the former pools are to be given a part in the new set-up, probably as advisory committees.

Fourth quarter forms under P-46 required a listing of dollar value by material classes of equipment salvaged in maintenance and repair operations as well as that of material sold from "excess inventories" to other utilities. Another innovation is a request for the prices paid for transformers, meters and conductor, which is to give the power division a price index of what utilities are buying and paying. A slash in the allowable inventory of wire and cable from 100 to 60% of 1940 base is expected to provide a working stock of materials for the redistribution program.

A special directive is in the making exempting utilities under P-46 from the 60-day inventory order under CMP regulation No. 2. A 60-day supply of copper wire would be insufficient for most utilities' operations and it is expected that the redistribution plan under P-46 described above will control utilities' inventories to better advantage.

Wartime Operation Reviewed At Meeting

Northwest engineers and operating men trade ideas on manpower, priorities and other restrictions

SIXTY engineers and operating men of Pacific Northwest utility companies and representatives of jobbers and manufacturers discussed wartime operating problems in Seattle, Wash., during two days in mid January. The conference, which was conducted in round-table fashion without formal papers, was sponsored by the Engineering and Operation Section of the Northwest Electric Light & Power Assn., with Magnus T. Crawford, Puget Sound Power & Light Co., chairman. This was the third such conference of sections of the Northwest association, the Utilization and Accounting sections having met in November and December.

Priority problems, manpower problems, the Northwest power pool, surplus equipment, substitutions for critical materials, use of automotive equipment and plant protection were the main headings under which discussions were grouped. Each was guided by a discussion leader. Some of the experiences exchanged and conclusions reached were as follows:

In the resale of materials, doubt existed whether price regulation 136 or 204 applied in certain cases, whether billings should be on the basis of 55% (or 85), or at cost plus handling. The group felt it should get replacement cost out of modern equipment in good usable condition. It was suggested that it was good practice, in case of doubt, to inform the OPA by letter what had been done. P-46-B, pertaining to installing additional facilities to serve ranges, was interpreted to mean that it implied only the installation of the third service conductor.

Turnover of manpower in the past year has ranged from 25% in some companies to more than 100% in certain departments of others. Companies in the war industrial centers have been hardest hit in this respect. Steam plant operators have been more difficult to get than hydro men. Less trouble has been experienced in line crews where wage scales are normally substantial. Various expedients for training men have been tried, notably by Puget Sound Power & Light Co., where meter readers, collectors and others in comparatively non-essential work were given a three-month course to fit them for station operators, maintenance men and other essential jobs. In the Portland territory the union has set up a nine-week course called apprenticeship school. Women meter readers have been employed by some companies, who have found them averaging 20% more efficient than men in urban reading. Three-month reading, with customer reading by post card, or estimated bills, in the interim months, has been adopted by some companies as a means of conserving manpower and rubber. Puget Sound employs women garage attendants.

Most of the companies have not applied for deferment for essential jobs as yet, Puget Sound Power & Light Co. being the main exception. This company has classified all its personnel in accordance with Job Classification No. 9 and has filed deferment for these men. This is considered a patriotic collaboration with the selective service act and the Manpower Commission as an anticipatory measure against the time when the whole manpower problem will become more acute.

Two listings of surplus or spare equipment have been made: (1) for the WPB, covering surplus over and above a minimum needed for maintenance of the system, this to be subject to transfer to other companies on order from WPB; and (2) a list of extra or spare equipment in certain critical operating categories, that will be available for transfer to companies in the Northwest under extreme war emergency conditions, such as bombing or sabotage. This latter listing, originated by the Northwest association more than a year ago just after Pearl Harbor, has been revised, brought up to date and relisted by the coordinating group which coordinates the operation of the Northwest power pool. The emergency list contains equipment now maintained in company systems as spares, and the caution was thrown out that this equipment, which does not appear on the WPB surplus list, should be so stored or installed as obviously to be part of the operating system of the company.

Operation of the power pool during the past year was reviewed and found to have been invaluable, particularly during the very dry late summer and early fall. Pool members are eight large private companies, Bonneville and the municipal systems of Seattle and Tacoma. Four other sizeable companies and several smaller municipals and PUDs are brought under the benefits of the pooling because they are customers of pool members. Remarkable success in keeping the systems tied together has been experienced. The need for better communication between systems has been found. Pooling has been strictly on a voluntary cooperative basis without rules. Power transfers are under many varying types of contracts between companies, and billings are on the basis of schedules of transfers rather than on meter readings.

All the companies had effected some additional connections with lumber mills and other industrials having their own generating equipment for the purpose of tapping this additional capacity. These connections had added something to the firm capacity and to the kilowatt-hour output in the area. It had been found, however, that these industrials were not supplying as much surplus as expected because less fuel had been available than normally. The War Emergency Power Assn. formed in Utah for the purpose of interconnecting private companies and municipals heretofore not connected was cited as having been a remarkably successful wartime measure in that area.

A certain amount of confusion apparently exists as to interpretation of ODT rules with respect to truck and passenger fleet operation and the application of gas rationing thereto. Exchange of experiences indicated a lack of uniformity in the listing of trucks and cars, in the methods of purchasing gasoline, and in the interpretation of what constitutes essential and emergency work. Companies reported a considerable reduction in mileage run and gas consumed in 1942 as against 1941.

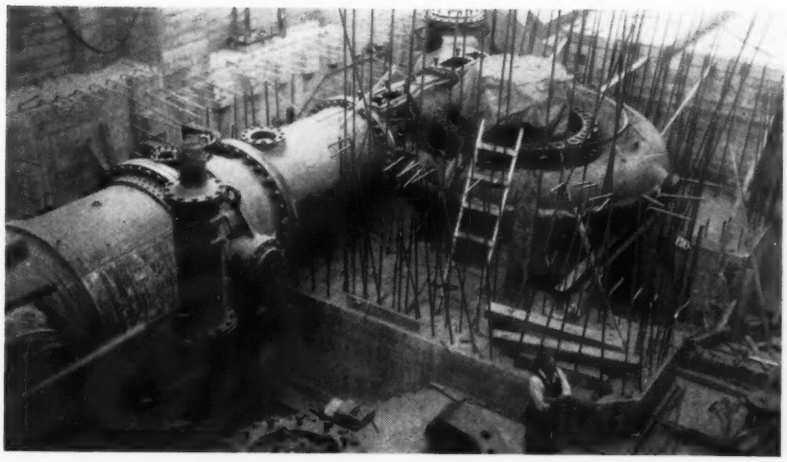
Creosote-dipped fir crossarm braces, timber structures for substations, concrete guy anchors and wooden guy guards were some of the substitutions for steel resorted to as conservation measures during the past year. Some of the disconnecting switches formerly installed for convenience at lightning arresters, potheads, and around each item of equipment are now being eliminated from design. Also the companies are now adapting and using equipment formerly considered obsolete and are loading lines and substations more heavily, employing ingenious home-made auxiliary water and air cooling for transformers.

How far to go in the protection of plants and stations from sabotage, air raids and other war hazards proved to be a moot question. All the companies have employed guards, installed protective lighting, fenced properties, protected glass; few have installed splinter-proof barriers; none have done any camouflaging. Total cost of all types of protection suggested for safeguarding all of a company's properties was found to be prohibitive.

Cost studies on several different types of bomb splinter barriers, sand bags, brick, concrete, wood frame filled with earth or sand, hollow concrete blocks similarly filled, had indicated that wood frame and concrete block construction were the cheapest and were satisfactory to the FPC and the War Department.

PELTON TURBINE

for Dutch Flat Power House



The new Dutch Flat Power House of the Pacific Gas and Electric Company will use a Pelton Turbine.

Here you see the installing of that Pelton Reaction-Type Turbine, 29,000 H.P., 400 R.P.M., 570 FT. effective head, together with the main inlet butterfly valve, relief valve and by-pass valve.

Pelton Turbines, both impulse and reaction type, have "grown up" with the electric companies. Through year-by-year improvements, Pelton has continually contributed to *more electricity per dollar.*

THE PELTON WATER WHEEL COMPANY

Hydraulic Engineers

2929 NINETEENTH ST., SAN FRANCISCO

EXCLUSIVE WESTERN REPRESENTATIVES for Baldwin-Southwark Division of Baldwin Locomotive Works, Baldwin-De La Vergne Sales Corp., Woodward Governor Co. and Cone Valve Division, Chapman Valve Mfg. Co.

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Subsidiary of THE BALDWIN LOCOMOTIVE WORKS

PCEA Panorama — Edited by Mary Shoop

Who Am I?

I was born in Paris, France, Dec. 9, 1883. I was brought to this country in infancy and attended grade schools and Smith Academy in St. Louis. From December, 1906, to January, 1908, I was an apprentice student with the Westinghouse Electric & Mfg. Co. at East Pittsburgh, Pa. In the "John Smith Panic" days of 1908, I served as a correspondence salesman for the Emerson Electric Mfg. Co. in St. Louis. I rejoined Westinghouse in 1909 as an industrial motor salesman. Who am I?

When the Westinghouse Lamp Division was formed in 1913, I was transferred to New York as assistant to the general manager. In the succeeding 16 years, I was district manager for the Lamp Division at Philadelphia, then St. Louis and later Chicago. Who am I?

In 1931 I was appointed regional sales manager of large appliance sales in charge of Pittsburgh, St. Louis and Chicago districts of the Westinghouse Electric Appliance Divisions. I was appointed Pacific Coast district manager for the parent company in 1939, the position I now hold. Who am I?

I am a member of the San Francisco Electric Club and a former director of the Pacific Coast Electrical Assn. I am a member of Occidental Lodge No. 163, St. Louis (Master Mason); St. Louis Royal Arch Masons; the Bohemian Club of San Francisco, and a past president of Chicago Rotary Club No. 1, in which I hold honorary membership now. My hobbies are gardening and fishing. I am married, have two sons, both in the armed forces, and a daughter; reside in Hillsborough Oaks and my name is: See page 112.

● DUE TO WARTIME restrictions on materials included on the WPB strategic materials list, more interest is being shown at the present time in PCEA's Uniform Electric Code than at any time in the past.

The current edition of the code has been adopted by the following cities:

Pomona, Santa Ana, Auburn, San Rafael, Culver City, Corona, Sierra Madre, Blythe, Chino, Ontario, Martinez, Santa Monica, Gilroy, Hawthorne and Napa.

A number of other California cities have the code under consideration and its early adoption is expected.

Repair School Popular

Applications for class exceed facilities

LARGE attendance and enthusiastic interest proved the success of PCEA's electrical appliance repair training school which closed Jan. 22 at Frank Wiggins Trade School in Los Angeles. Attendance for the first class on Jan. 4 was 28, for the second on Jan. 6, 46, and enrollment was closed on the third night at 50, the maximum number which could be given instruction in this work under the existing facilities.

Continued applications for enrollment indicated the great desire for training in this field.

Sessions were held Monday, Wednesday and Friday nights from 7 to 10 p.m. The course ran three weeks.

Free training was given in the basic elements of electricity, repair of appliances, and the care and use of tools. Students came mainly from three classes —women, older men and physically handicapped persons. Since all are free from the demands of military service, they promise a remedy for the labor problem of electrical dealers.

Success of this initial training school indicated the possibility of extending the activity to other locations.

Sponsors with PCEA were Los Angeles electrical dealers, the United States Employment Service, local school authorities, Southern California Edison Co., Los Angeles Bureau of Power and Light, and the Pasadena and Glendale Light and Power Departments.

● WHEN, AS AND IF PCEA has a spring conference, it will present a timely program now being prepared under the direction of the association's guidance committees.

If a conference is not held, information developed for its program will be made available to PCEA people so that there will be no interruption in the stimulating exchange of ideas characteristic of PCEA meetings.

Last year the annual spring convention was replaced by a business conference described by many as the most valuable gathering PCEA has ever held. It will be repeated this year if transportation and other conditions permit.

Chairmen and vice-chairmen of guidance committees are Frank C. Angle and P. P. Pine, business development section; H. A. Lott and L. J. Moore, operating economics section; L. C. Rausch and F. C. McLaughlin, administrative services section.

Electriquiz

G. H. P. Dellmann, commercial sales engineer, San Diego Gas & Electric Co., is the author of this interesting quiz.

1. If one kilowatt-hour of electric energy, costing 5c, will perform a certain task, what would it cost to perform the same amount of work manually, with labor at 50c per man-hour?

2. 100,000 kilowatts of electric power is capable of serving a community of some 500,000 population. How many servants would those people need if all tasks performed by electricity were done manually?

3. In dimout areas an automobile may proceed with headlights having a beam candle power of 250. How many footcandles are permitted on any point of the sidewalk in front of a show window or store?

4. For every $100 of capital investment in a private utility in 1940 on which the investor earned about $5, the government received in taxes approximately (a) $1.50 (b) $3.00 (c) $4.50.

5. The present American household electric bill represents approximately (a) .8% (b) 1.5% (c) 2.5% (d) 5% of the cost of living.

6. Electricity output in the United States is now at an all-time high and is running about (a) 2 (b) 3 (c) 3½ (d) 4 billion kilowatt-hours per week.

7. During the past three years, while the cost of living has increased 20%, the average price of electricity has dropped (a) 4% (b) 9% (c) 13% (d) 19%.

8. The cost of electric service for manufacturing aircraft is approximately (a) 5c (b) 25c (c) $1.25 (d) $5 for each $100 worth of planes.

The answers are on page 112.

Your friend . . . the Foot Candle

A foot candle is the illumination from one standard candle on a surface one foot from the light source.

It is the unit of measurement of illumination.

But more than this, the foot candle is man's staunch friend.

In adequate amounts it means his family will have sufficient light in the home . . . he and his fellow workers sufficient light for better, safer factory production or efficient office detail.

For almost 100 years the MILLER organization has known the foot candle on working terms. This lighting experience bridges the broad ground from the whale oil lamp to the modern continuous fluorescent lighting system now helping industry speed out planes and tanks and cannon.

It has involved engineering and design and skill with copper . . . glass . . . steel . . . aluminum and many new non-metallic materials. It has required ingenuity and resourcefulness and pioneering.

It qualifies us to work with those who need better lighting in war industry. It enables us to cooperate intelligently with those who promote better lighting and sell and service it, too. It means that the MILLER engineer (located in principal cities) can serve you in one of several ways, for better lighting today and tomorrow.

Miller Lighting

. . . for better, safer production
. . . for a more prosperous peace

THE MILLER COMPANY • MERIDEN, CONN.

Today our men and women are also busy making gauges, bomb noses, torpedo and searchlight parts, wiring devices, ship fixtures and many other precision parts for Army & Navy.

NEWS of the industry

STATE POWER AUTHORITY PROPOSED IN COLORADO

Bills introduced simultaneously in Colorado's senate and house of representatives Jan. 20, propose the creation of a State Power Authority under which the state could acquire and operate any or all privately-owned electric and gas systems in Colorado.

The measures are identical and designed primarily, informed sources state, to take advantage of the national "Death Sentence" which applies to all holding companies, and acquire Public Service Co. of Colorado when Cities Service Co., holder of Public Service Co.'s common stock, shall be forced to divest itself of ownership in the local concern.

Other holding companies with subsidiaries in Colorado that come under the holding company act include Electric Bond and Share, Billesby Corp., and Federal Light and Traction. However, Public Service of Colorado is the acknowledged and immediate objective of the proposed legislation.

The bills are well sponsored, by two senators and four state representatives. Their purpose is described by the head of a Denver investment banking firm as: " . . . designed primarily to conserve and develop the natural resources of the state by providing for the acquirement by the authority of an integrated and interconnected system, or systems, of gas and electric utilities to provide low cost power for the development of the mineral, industrial, agricultural and other resources of the state—a non-profit body, without power to incur any obligation or indebtedness of the state or other political subdivision of the state."

State, counties, municipalities and school districts, the measures provide, shall continue to derive an amount equal to taxes now being paid by utilities in their respective communities. Also provided is that net profits of the authority, after operating expenses, taxes and servicing of revenue bonds, shall be paid to the municipalities and counties in which the authority owns and operates its properties. It is specifically emphasized by sponsors of the legislation that the plan is designed to "prevent the encroachment upon the resources of this state by the federal government, and to prevent the acquisition by any federal agency of the private utilities now operating within the state which are threatened by legislation passed, and legislation pending in the national congress."

The sponsors argue that it is to the state's interest to maintain Public Service Co. of Colorado as an integrated concern. In this connection, they point out that when the Grand Lake diversion project is completed and power created through that undertaking is available, a large corporation will be required to market the electricity.

Public Service Co. of Colorado's capital structure includes some 31 million dollars, par value, common and preferred stock; $52,000,000 of bonds are outstanding.

The same interests which have sought favorable legislation in California and other states, and have been identified with municipal power enterprises in Colorado, are understood to have drawn the "Power Authority" bills now introduced in the Colorado general assembly.

● THREE ONE-DAY rural electric conferences in place of a single 3-day meeting were held last month under the direction of the California CREA at Davis, Fresno and Los Angeles. Preventive maintenance of farm electrical equipment was the theme of the program and rural electrification specialists of utility companies and manufacturers, as well as farm advisors, attended.

NOTICE TO SUBSCRIBERS

Readers of ELECTRICAL WEST will observe that the "trim size" of the current issue of the magazine is slightly smaller than that of previous numbers. The reduction in size has been made to enable the publishers to meet an order of the War Production Board limiting the amount of paper that may be used in 1943. Subscribers will note, however, that no change has been made in size of type or in the amount of editorial content per page, but that a substantial saving in paper has been effected merely by trimming the margins.

The publishers have adopted the new size as a war measure and as a contribution to the conservation of manpower and transportation facilities in the production and distribution of paper. Service to the reader has not been sacrificed and will be maintained as far as humanly possible in the face of the problems confronting all of us in our united efforts to win the war.

BONNEVILLE POWER GOES TO WAR INDUSTRIES

War industries purchased 81.4% of the Bonneville Power Administration's power deliveries in fiscal 1942, according to the annual report filed by Administrator Paul J. Raver. Other sales consisted of public utility companies, 14.7%, public agencies, 3.8% and federal agencies 0.1%. By June 30, 1942, industrial power contracts and commitments accounted directly for 92% of current contracts and commitments for 899,920 kw.

Raver's report urged construction of additional dams on the Columbia River; predicted a power shortage by 1944 unless this was done and indicated a normal power demand of 5,000,000 kw. for the Northwest by 1949. A seven-point program covering future allocations of war industry to the Northwest was recommended. Considerations urged by Raver include the following:

1. Columbia river power should be sold to such industries and on such terms as help the long run and best development of regional resources.

2. The establishment of basic electro-process industries should be followed by fabricating and supply industries so as to support the operations of the basic industries and to provide products for regional consumption at lower costs than obtained at present.

3. New feasible industries should be financed and managed as far as possible by business men of the region.

4. Research on new processes to use electric power and raw materials in the region must be stimulated by governmental agencies and the results of such research should be freely available for use by independent enterprise.

5. The opposition of established industry to new competition from Northwest industry and the attempts of any industrial groups to control large amounts of Columbia River power must be prevented.

6. Within the region, new industries should be encouraged to decentralize in accordance with the advantages of locational factors and of the "postage stamp" rate of the regional network.

7. Columbia River power should be sold on such terms as contribute to the conservation of other resources of the region and as to prevent the destruction of scenic and recreational assets.

● FFDERAL POWER PLANTS were omitted in recommendations for new construction appropriations in President Roosevelt's $109 billion budget. The USBR, the Army Engineers, TVA and the Bonneville Power Administration were all listed to carry on their reduced schedules of expansion from unexpended balances. An operating and maintenance appropriation of $3,287,000 was included for Bonneville.

Guard YOUR turbines
with this oil that helps to
KEEP OUR SUBS ON THE PROWL!
It's the "mother" ships that keep our submarines a potent striking force. The undersea boats depend on them for repairs and supplies.
In the turbines of many of these "mother" ships, as well as battleships, cruisers and aircraft carriers of the U. S. Navy, you'll find the new rust-preventive Shell Turbo Oil . . . keeping main bearings, gears and governors running smoothly under the most grueling operating conditions.
Shell Turbo Oil can give this kind of performance because it has all 3 of the characteristics vital to the proper lubrication of modern turbines:
RUST PREVENTION
SUPERIOR OXIDATION STABILITY
MINIMUM FOAMING TENDENCY
Are your turbines getting this protection?
SHELL TURBO OIL
A name to Remember
SHELL

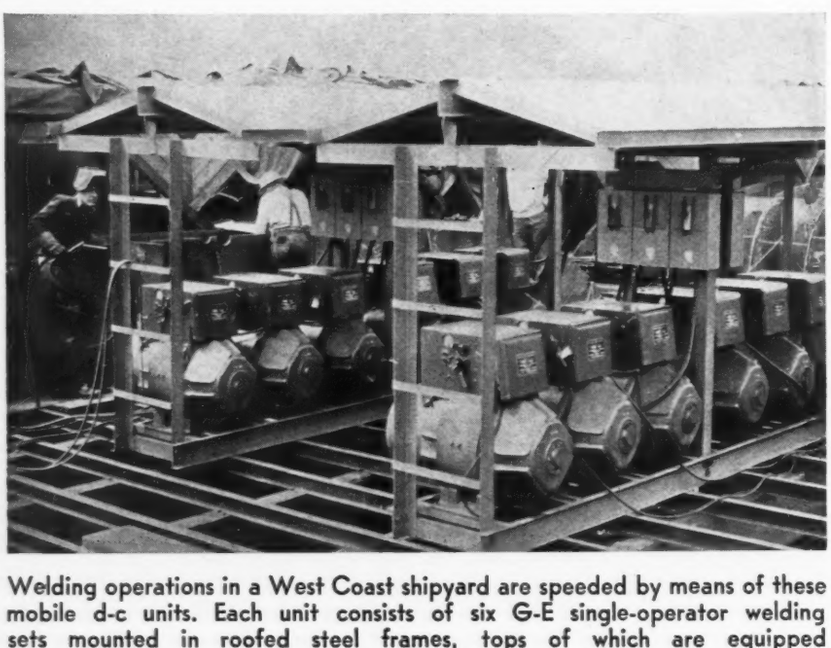
$700,000 RATE REDUCTION ORDERED IN PORTLAND

Portland General Electric Co. has received an informal order from Ormond R. Bean, State Public Utilities Commissioner, to place $700,000 alleged excess earnings for 1942 in a reserve fund for the benefit of customers, and to make immediate rate reductions in the Portland area equivalent to $700,000 annually. The Commissioner states such action would be in line with the company's promise to readjust rates throughout its territory based on further rate studies. The promise was made at the time rates were reduced in Salem and vicinity in May, 1941.

James H. Polhemus, president, declared the company is prepared to reduce rates in the approximate amount requested by the Commissioner if such reduction can be put into effect on a contingent basis so that in the event that certain existing conditions do not prevail in the future rates can go back to their present levels. These contingencies are: (1) that the company continue to receive Bonneville power in the quantity and at the rate now prevailing (this power is now supplied on a day-to-day basis with the Administrator reserving the right at any time upon 24-hour notice to discontinue delivery in part or in whole and the right to increase the rate for this power under certain conditions; (2) that Bonneville does not take away from the company certain of its large war industry customers; (3) that possible new and unusual taxes do not dip heavily into future net earnings; (4) that possible new dimout and blackout regulations do not cut deeply into the company's residential and commercial revenues. There is no certainty as to any of these contingencies not happening, states Polhemus, and any reduction not taking them into consideration would be imprudent.

Commissioner Bean is unwilling to accept this type of "contingent or sliding rate," believing that legal limitations and sound regulatory policies prohibit it. He agrees that if negotiations cannot be satisfactorily concluded with the company a formal hearing will have to be held to determine (1) what is the company's legal rate base; (2) what is a fair return under state law; (3) legality of establishing a reserve fund as contemplated (this is the first instance of resort to establishment of a reserve fund for the benefit of customers written into the Public Utility Law by the 1933 Legislature.)

Difference of opinion also exists between the Commissioner and the company as to the value of the company for rate making purposes, the Commissioner contending this figure is about $59,000,000 as against the company's contention of $63,000,000. Based on the company's figure for this rate base, excess earnings for 1942 are considerably less than $700,000; in fact, they are practically nil.



Welding operations in a West Coast shipyard are speeded by means of these mobile d-c units. Each unit consists of six G-E single-operator welding sets mounted in roofed steel frames, tops of which are equipped with projections for receiving crane lifting hooks. Motor generators are thus protected from the weather and the units are easily moved by crane

UTILITY FILES APPLICATION ON REFUNDING PLAN

Puget Sound Power & Light Company, Seattle, has applied to the public service commission at Olympia for permission to issue $60.000,000 in refunding bonds, debentures and new classes of common and preferred stocks. Director Frederick G. Hamley said the application involves the largest sum of such securities ever contained in any application filed with the state department. He said the refunding plan would save the company about $1,200,000 a year in interest and amortization.

Two applications were filed by the company, one asking authority to issue 27,500 shares of prior preference $5 dividend no-par stock and 435,575 shares of $50 par value common stock.

The other application covers the proposed issuance and sale of $52,000,000 first mortgage 3½% bonds, due in 1947, and $8,000,000 in 3% debentures, due in 1951.

Washington Court Will Review PUD Franchise

Charging irregularities in the granting of a blanket county franchise for power line construction by the Clark County, Wash., county commissioners to the Clark County PUD, a number of property owners have petitioned the superior court of the state of Washington for a review. The petition is headed by T. E. Roach, vice-president and general manager, Northwestern Electric Co.

The petition charges the county commissioners failed to name the roads on which the franchise was granted, failed to post and publish the proper notices and otherwise failed to act in full accordance with the law. Date for the review had been set by Superior Judge Charles Hall for Jan. 15.

● CENTRAL VALLEY project studies announced in December by the U. S. Bureau of Reclamation will be under the supervision of George W. Howson as field coordinator who will serve directly under Dr. Harlan H. Barrows who heads the survey. Howson previously had been in charge of the Kings River project investigations for the USBR.

● CALIFORNIA ELECTRIC POWER CO. has created a district at Palm Springs and has named Francis Crocker superintendent. Palm Springs formerly was a part of the Coachella district, with Crocker as local agent. Community growth and war industry were responsible for the change, the company stated.

Mining—Number One War Industry

The mineral products of the earth are the prime necessities of war... and peace

THE SURFACE of the earth provided primitive man with the things he needed for his meager existence but civilization really began when he became curious about its interior. This curiosity has brought us a long way. For the earth has yielded — out of its deep recesses — all the raw materials of modern industry. And today, in the grueling race of production, our mining industry is providing the raw materials upon which depends our survival. Our mines and quarries must supply a long list of materials without which a successful war cannot be fought.

Take steel, for example. War without steel is inconceivable. Steel starts with iron ore, limestone and coke. These are products of mines and quarries. It takes power and heat to get these materials out of the ground, to refine them and to transport them to the point where processing begins. All the subsequent operations culminating in the steel ingot, shape or plate, and in moving the final product to the point of use require power and heat.

The major source of this power and heat is coal.

Production of a ton of steel, it has been stated, requires two tons of coal. Smelting of the pig iron alone, 60,000,000 tons in 1942, required the coking of some 75,000,000 tons of coal. Pig output is expected to rise to 68,000,000-70,000,000 tons in 1943, carrying coal consumption up to 85,000,000 tons. At the same time, output of steel ingots is expected to rise from 87,000,000 to 97,000,000 tons. Think what this means in terms of power and heat.

Another vital metal is copper. Modern armies need copper. This point is dramatically illustrated in a recent memorandum by Robert P. Patterson, Under Secretary of War, in announcing the release of 4,000 men from military service to return to the mines and increase copper production. "In a single minute of combat", Mr. Patterson declared, "a flight of 50 fighter planes shoots away 7 tons of copper. A 37-mm. anti-aircraft gun uses up a ton of copper every twenty minutes it is in operation. Six hundred pounds of copper go into every medium tank, and a ton into the engines and airframe of a Flying Fortress. The Signal Corps alone needs 5,000 tons of copper every month for radio and telegraphic and telephonic equipment. An army without copper would be an army without speed, maneuverability or firepower. It would not last a day in battle".

Seven tons of copper for one minute of combat by 50 fighter planes means from 200 to 700 tons of ore, depending upon its grade. Small wonder that the War Department was willing to release drafted miners from military duties to produce more copper.

But other metals are equally important in war: tungsten, nickel, manganese, chromium, vanadium and molybdenum for alloy steels; zinc for brass and die castings; tin for bronze and bearings; aluminum and magnesium for aircraft; lead and mercury for ammunition; silver for electrical equipment, bearings and solder, and so on. Even relatively insignificant non-metallics, like mica and diamonds, suddenly assume critical importance.

And let us not lose sight of the fact that without adequate energy, i.e., heat and power, production, processing, transportation and the relative comforts to which we have become accustomed would be impossible under war conditions. Coal is the major source of energy in the United States. It supplies more than half the total in normal years.

The railroads of the country alone used 110,000,000 tons in 1942 to move freight and passengers and service their facilities. Utilities consumed over 68,000,000 tons in the production of electric power. Over 135,000,000 tons of coal were consumed last year in maintaining the level of heating comfort necessary for the maintenance of efficiency and morale. The consumption, this year, will be even greater.

In short, the mineral products of the earth are the prime necessities of war.

The nations that control the world's mineral resources and make the most efficient use of them will win the victory.

Before the war, the British Empire and the United States together controlled probably 75 per cent of the world's mineral production. This would have been a most potent weapon in the United Nations' arsenal if the whole strategy of Axis expansion had not been influenced by mineral objectives. Addressing the American Zinc Institute on the subject last April, E. W. Pehrson, of the U. S. Bureau of Mines, estimated that the Axis had improved its position in world mineral resources in the following percentages: iron ore, from 6 to 46; steel production capacity, 20 to 34; petroleum, 1 to 7; coal, 27 to 53; copper, 5 to 10; lead, 7 to 22; zinc, 16 to 27; tin, 1 to 72; manganese, 2 to 30; chrome, 3 to 30; tungsten, 6 to 60. In the light metals, areas now Axis-controlled produced in 1940 54 per cent of the world's aluminum, 49 per cent of the bauxite (the principal source of aluminum) and two-thirds of the magnesium.

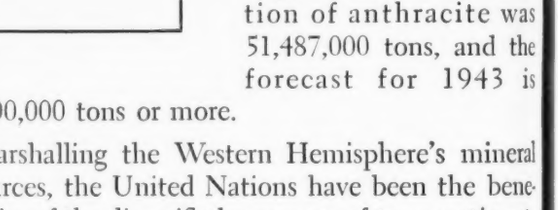
This is the eighth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

Despite these gains, the industrial war power of the United Nations still can outweigh that of the Axis by a considerable margin. It already has begun to surpass it. The problem is to convert quickly our potential mineral resources into implements of war. In this conversion, a heavy burden of responsibility has been placed on the mining industry of the United States as the largest producer of many metals, minerals and fuels. In fact, the United States mining industry began to go on a war basis a year before Pearl Harbor. The curves of demand for domestic copper, lead, zinc and other metals began to rise sharply in 1940, and were paralleled by a rising coal production.

How well the job has been done cannot be revealed in accurate figures in many cases because of censorship. In metals, however, some idea of production gains can be indicated in comparative terms. United States copper production, for example, is breaking all previous records. Aluminum capacity will be more than seven times its annual peace-time average. Magnesium plants now building will have a capacity 100 times the largest yearly before-the-war figure. Molybdenum, of which the United States has the largest single mine in the world, is being made available in record quantity. Zinc, lead and mercury are surpassing expectations in meeting wartime demands, and tungsten, chromium, manganese, antimony and iron and steel are being turned out in record-breaking quantities.

Bituminous coal production in 1942 was 580,000,000 tons, the greatest in history, valued at more than $1,300,000,000 at the mine. Some 430,000 or more men were employed in 1942 and received at least $750,000,000 in wages. Bituminous production in 1939 was 394,855,000 tons, while the output for 1943 is forecast at approximately 600,000,000 tons – another new United States record. The 1942 anthracite output was 59,961,000 tons, valued at over $270,000,000 at the mine. The industry employed some 85,000 men and paid out at least $180,000,000 in wages. The 1939 production of anthracite was 51,487,000 tons, and the forecast for 1943 is 65,000,000 tons or more.

Marshalling the Western Hemisphere's mineral resources, the United Nations have been the beneficiaries of the diversified resources of two continents – in particular of Canada's nickel and coal, Mexico's lead and antimony, Chile's copper, Bolivia's tin, Peru's vanadium, Brazil's iron, and Venezuela's petroleum. With other United Nations contributing their share of metals and fuel, the grand total is an impressive array of potential munitions and matériel to lend assurance of certain victory over the Axis. Sheer weight of metal, properly used, will win the war, and our mineral industry will have played an indispensable and essential part in the inevitable outcome.



President, McGraw-Hill Publishing Company, Inc.

BONNEVILLE STATEMENT DUBBED MISLEADING

Public statements by the Bonneville Power Administration that "a total of $7,680,000 has been returned to the people of the United States during the past 12 months toward liquidation of their investment in Bonneville and Grand Coulee dams and the 2,000-mile Federal transmission grid" brought forth protests in the Northwest last month that such a statement was "misleading."

Chief protestant was the *Oregon Voter*, Portland weekly magazine, which pointed out that the BPA had a $22,750,000 budget for the current fiscal year. The *Voter's* study called attention to increases in the number of Bonneville employees from 1,326 in 1941 to 2,412 for the present fiscal year. Also stress was laid on the BPA operating budget which was reported as $3.361,000 for fiscal 1942 and $5,257,000 for fiscal 1943. It points out that these amounts include nothing for interest on the investment in facilities nor for a depreciation reserve.

The Bonneville statement shows that power deliveries during 1942 were 3,473 million kwh. and that 700 miles of new transmission line and 16 new power substations were placed in operation during the year. The system now includes 2,215 miles of transmission lines and 48 substations.

● TRANSACTIONS for acquiring the distribution system of the Northport Power & Light Co., Colville, Wash., have been completed by the Stevens County Rural Electric Assn., after almost three years of negotiation. Plans for the purchase were started in June, 1940, through holders of the controlling stock of the Washington Corp. and the Kootenay Power & Light Co. of British Columbia. Northport company holdings now comprise only the transmission lines from Paterson to Northport. Under the recent purchase, the Electric association adds six miles of transmission line and 180 customers, giving it a total of 560 miles of lines serving more than 1,000 customers.

● RECOGNITION of two independent employee unions must be withdrawn by Pacific Gas and Electric Company according to an order issued by the NLRB on Jan. 5 in Washington. The two are the California Gas and Electric Employees Union, which was dissolved some months ago, and the Western Utility Employees' Union, representing workers in the San Joaquin Power Division of the company. The latter group has opposed the NLRB action, which resulted from charges filed by the IBEW, and has announced that it will carry the case into the federal courts.

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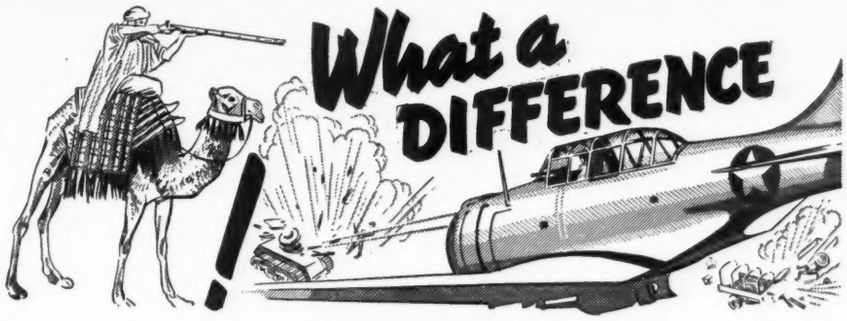

And there's just as much difference between the *streamlined* BRIEGEL METHOD of making conduit connections and former, old-fashioned methods!

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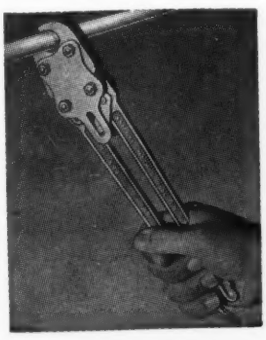

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RUGGED Because of their rugged construction throughout, Kuhlman Distribution Transformers stand up on the job with a minimum of maintenance. Insulation, bushings, tanks, lifting lugs and all component parts are of extra strength to insure uninterrupted, trouble-free performance year after year.

RELIABLE For more than forty-five years Kuhlman has been successfully designing and building good Distribution Transformers. Records of their performance on the job give ample evidence of their reliability under any and all conditions. For reliability it pays to operate Kuhlman Transformers.

REFINED Among the many Kuhlman refinements is the patented B.I. (Bent Iron) core which results in lower exciting currents, reduced weight and better operating characteristics. Pocket Bushing seats pressed into tank, "Quick-Grip" primary bushings and scores of other refinements increase a Kuhlman's efficiency.

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NAVY COMMISSIONS OPEN TO QUALIFIED ENGINEERS

West Coast Naval Officer Procurement offices are seeking additional electrical, mechanical and radio engineers and instructors in these fields for service in several commissioned officer classifications. Qualified men are urged to apply to Officer Procurement offices in Los Angeles (850 Lilac Terrace), San Francisco (Central Tower Bldg.) and Seattle (117 Marion St.)

Men 19 to 50 with electrical engineering degrees may find berths with the "Seabee" battalions constructing bases, experienced older men being preferred. For radar maintenance openings, the Navy wants men 19 to 50 who have degrees in electrical, radio or communications engineering, or extensive practical experience in the field of radio backed by less college training.

Another need is for instructors in diesel, electrical, mechanical and radio engineering. Applicants must be graduates of accredited colleges, age 25 to 45. Graduate students who are part-time instructors, or full-time instructors may qualify.

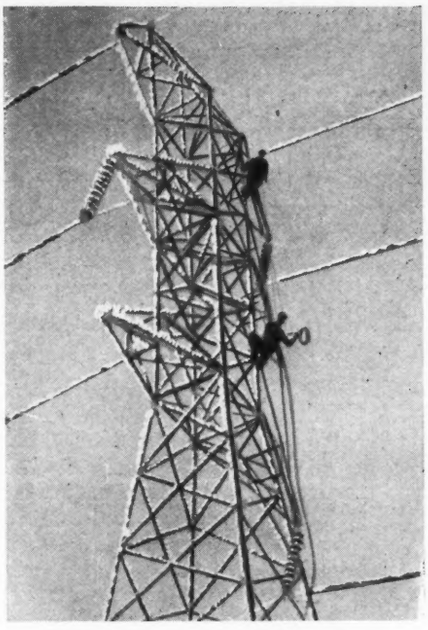
Electrical and mechanical engineers with special qualifications may serve at once as commissioned officers, expediting production in plants manufacturing products under Navy contracts. The call is for men over 30 who have specialized in industrial engineering, marine, ordnance or steam power engineering. It is desirable that candidates have a thorough knowledge of production, layout and machines, and problems in manufacture of diesel engines, radio and electrical equipment or castings and forgings. Formal educational requirements will be waived for outstanding men with eight years of practical experience.

Farm Chemurgic Group Seeks Answer To War Demands

Farm chemurgy came to Oregon early in January under the pressure of war production demands for new raw materials, but is expected to remain after the war to take its place in the state's long range economic planning.

Morton Tompkins, state grange master, was elected president of the Oregon State Farm Chemurgic Committee at an all day meeting Jan. 7, featuring speakers from the state college of agriculture, dirt farmers and business men. Dean William A. Schoenfeld, director of the Oregon Agricultural Experiment Station, Corvallis, and Ed Aldrich, publisher of the Pendleton East Oregonian, were elected vice-presidents; while H. W. Derry, manager, new industries department of Pacific Power & Light Co., Portland, was named secretary. The organization is a unit of the National Farm Chemurgic Council.

It was pointed out at the organization meeting that farm chemurgy recognizes three factors—agriculture, science and industry. Science, through research and experiment, points the way to the processing of farm products, either new crops or waste and by-products of existing crops, to be utilized by industry for the production of materials from which useful products can be made. The chemurgic program seeks new uses for surplus farm products as industrial raw materials, new farm products to supply existing or new needs, and profitable ways of using present wastes and by-products. Fields to be studied in Oregon through committees appointed by the new Council include: alcohol, starch and synthetic rubber; cannery wastes; pulp and paper mill wastes; flax; wool and mohair; dairy products; plant testing; seed; essential oils; nut waste products; waste woods; livestock and poultry wastes; and fisheries.



Here's how Utah Power & Light Co. transmission towers and wires looked in late December, when glacial fog sheathed them in ice six inches thick in spots. Three 130,000-volt lines snapped, cutting the northern end from the rest of the system and bringing a 30 minute blackout to that section

● SILVER valued at more than $3,000,000 has been loaned by the Treasury for use as bus bars at the Basic Magnesium Co. plant in Nevada.

ARIZONA UTILITY ORDERED TO CUT RATE SCHEDULES

Rate reductions totaling $300,000 on a 1942 annual basis have been ordered for the Central Arizona Light & Power Corp. by the Arizona Corporation Commission. All rate schedules were involved. Basis of the reduction, as stated by the commission, was savings expected to be made from delivery of Parker Dam power to the company.

New irrigation rates vary from 9 to 7 mills per kwh., the old rate having started at 12½ mills. Residential rates were combined into two schedules, one for Phoenix and another for all territory outside the city. The new Phoenix rate is $1 for the first 12 kwh.; 3c per kwh. for the next 108 kwh.; 2.5 cents per kwh. for the next 130 and 1.6 cents per kwh. for all excess. Outside the city the initial rate is $1.15.

Hearings Resumed In Utah On Power Company Case

Rate hearings involving Utah Power & Light Co., recessed during December, 1942, were reopened by the Utah Public Service Commission in Salt Lake during January for additional testimony. Purpose of the hearing is a valuation study in which the state seeks to set up a low valuation as the basis for rate reductions amounting to $1,000,000.

Points of issue during the last sessions were construction fees paid to the Phoenix Construction Co., an EB&S subsidiary, and organization expenses incurred at the time Utah P&L was set up in 1913.

Power Bill To Go Before Washington Legislature

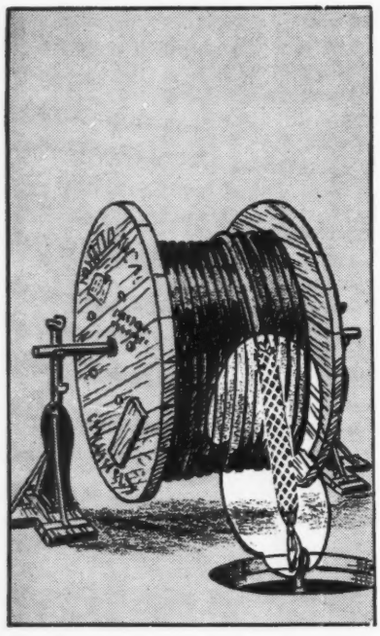
More than 54,000 signatures for Initiative No. 12, providing for acquisition of private power properties in their entirety rather than piece-meal, have been filed by the Washington State Grange, sponsors of the measure, with Belle Reeves, secretary of state at Olympia. Only 50,000 signatures are need to insure presentation at the state legislature.

R. V. Houghton, Seattle attorney for the Grange, said he planned to file additional names before the deadline to allow for discards. In the past an average of 22% of the signatures has been thrown out for illegibility, duplication and other reasons, it was stated.

● A TOTAL OF 1,859,695,000 kwh. was generated at Grand Coulee Dam in 1942 for a 900% increase over the 1941 delivery of 204,917,000 kwh., the Bureau of Reclamation reported last month. Maximum demand was 380,000 kw.

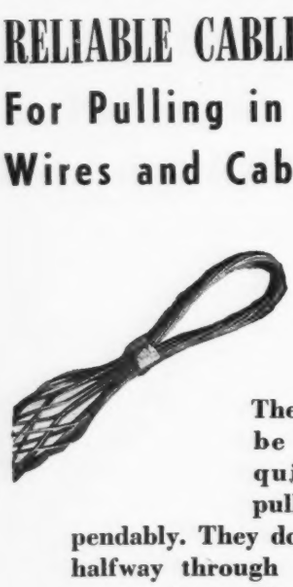
SPEED

CONSTRUCTION and EXPANSION of PLANT FACILITIES



RELIABLE CABLE GRIPS

For Pulling in Wires and Cable



These grips can be installed quickly and pull cables dependably. They do not let go halfway through a duct because wires pull with evenly distributed load. Eight different styles—all supplied in a full range of sizes.

Reliable ELECTRIC COMPANY
OVER 30 YEARS SERVICE TO THE UTILITIES
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COMBINE MAKES LOW BID ON ROSS DAM ADDITION

Offering the Seattle Board of Public Works what was termed "a very favorable bid," the three-company combine of General Construction Co. of Seattle, Morrison Knudsen Co., Boise and J. F. Shea, San Francisco, submitted a low proposal of $7,144,922, including a 3% sales tax, for construction of the second unit of Ross Dam. The bid totaled $6,936,818 and the sales tax $208,104.

Guy F. Atkinson, San Francisco, bid $7,785,079 plus $223.552 sales tax, and S. A. Healey, White Plains, N. Y., bid $9,720.200 plus $291,606 sales tax.

General Construction Co., J. F. Shea and the Columbia Construction Co. participated in construction of the initial unit, securing the contract for a total of $8,600,000.

Floods In Northwest Bring Record Peak Power Loads

Flood conditions in some sections of the Northwest early in January which raised tailraces and cut down capacity of several hydro plants, resulted in new record peak loads being imposed on the generators of the Bonneville and Grand Coulee plants. On Jan. 13 the two stations carried a combined peak load of 729,000 kw. on machines rated at 626,400 kw. This represents an overload of 16%.

During the past month the Northwest experienced some of the most severe weather in its history. Storms and freezing weather brought widespread interruption in both the Seattle and Portland areas. Many lines went down due to heavy ice or snow loading or to falling trees.

Olson Appointments Break Precedent In California

One of the last acts of retiring Democratic Governor C. L. Olson of California was to appoint Frank W. Clark to the California Railroad Commission and re-appoint Richard Sachse to the same body. Thus for the first time in the history of that regulatory organization, one governor has been able to appoint a majority, since Franck R. Havenner, another Olson appointee, still has four years to serve.

Clark has been state director of public works throughout the Olson administration, Sachse was one time chief engineer for the commission. Havenner, who was elected president of the commission, is a former Congressman. All are Democrats, and all have frequently expressed themselves favorably on the question of government ownership of utilities.

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ESSENTIAL UTILITY JOBS DEFINED BY WMC

Electricians, motor repairmen and appliance servicemen are performing services essential to support of the war effort, War Manpower Commission has ruled.

As a result, men engaged in these and other similar occupations listed in Selective Service Bulletin No. 42 should be considered for occupational deferment by their local draft boards.

Deferment consideration should be given only those workers capable of all-round repair services and then only to the extent and number required to meet minimum essential needs of the community, Selective Service warns. These criteria also govern individual deferments for workers in essential activities.

1. Training, qualifications and skill of registrant to engage in the occupation.
2. Training, qualification or skill required for proper discharge of duties.
3. Availability of persons with the same qualifications or skills, or who can be trained to replace the registrant and the time in which such replacement can be made.

Included in the list, which is limited to occupations requiring six or more months training, are these occupations: electric appliance serviceman; electric motor repairman; electrician (all around); automotive electrician; elevator repairman; foreman (engaged in supervisory duties in connection with repair services as described); furnace installer and repairman; gas appliance serviceman; machinist (all around); maintenance mechanic (all around); office and business machine serviceman; oil burner installation and serviceman; radio repairman; refrigerator repairman; tabulating machine serviceman; time recording equipment serviceman, and welder (all around).

Occupational Bulletin No. 9, which defines essential occupations in electric utility operations, is due to be re-issued within several weeks. The original bulletin, issued last spring, contained 86 occupations. That list has been condensed by WMC's technical committee.

● BRINGING THE TOTAL capacity of the plant to more than 950,000 kw. an additional 82,500 kw. generator was installed last month at Boulder Dam. This is the twelfth unit to be put on the line at this plant.

Installation of another large generator at Boulder is going forward as rapidly as priorities for materials and fabrication will permit, the Bureau of Reclamation reports, and is expected to be in operation by early 1944.

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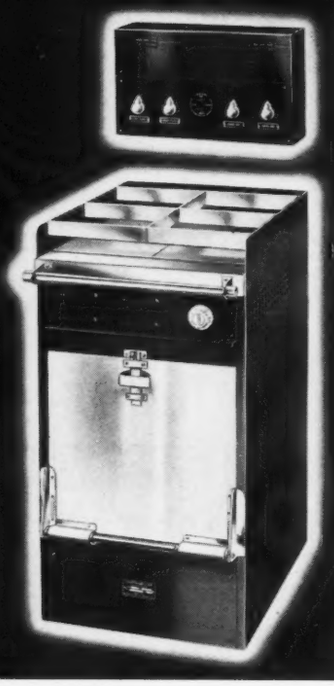

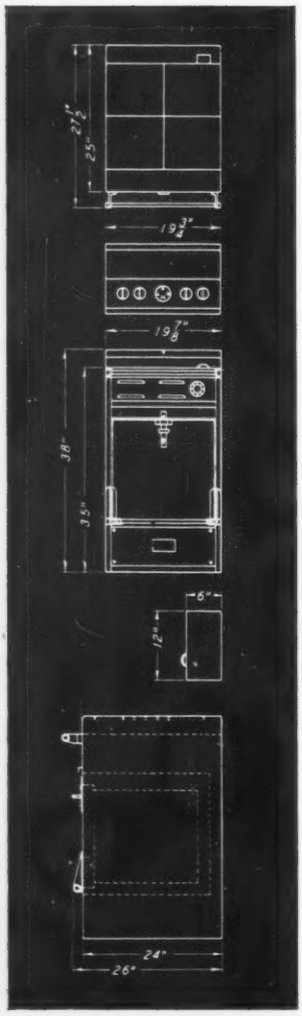

DESIGNED for submarines and ship's pantries, this model is also available without searack and guard rails for use on land and in crowded quarters.

War plants, shipyards, and other vital enterprises will find in the complete Electromaster line of heavy duty electric cooking equipment a model for every requirement. All are built to official specifications. All are priced sensibly for prompt delivery.

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EEI ISSUES RULES FOR HOME SERVICE AWARD

Only prize awards contest to be administered by the Edison Electric Institute for the calendar year 1942 is the Laura McCall award for achievement in the home service field, all others having been dropped for the year. Sponsored by *McCall's* magazine, this contest will be tuned closely to the war effort.

An engraved placque, four illuminated parchments and a total of $225 in prizes is offered to private utility operating companies and to individuals in those companies "who have made during the calendar year 1942 the most outstanding contribution to the war effort, through assistance to government bureaus in furthering the nutrition story and its relationship to the health of our civilian population; in emphasizing the importance of the care and maintenance of electrical household equipment; also assisting public compliance with local blackout and dimout regulations affecting domestic lighting, and in general advancing the benefits of efficient electrical living in the home."

Reports and exhibits must be received by the Edison Electric Institute on or before Mar. 31, 1943. Contest rules may be secured from the Institute, 420 Lexington Ave., N.Y.

General Electric To Build New Plant On West Coast

Pacific Coast manufacturing operations of the General Electric Co. will be increased late this summer when production of marine cables begins in a large factory building recently purchased in Oakland.

According to an announcement by R. M. Alvord, commercial vice-president, the company was selected by the Navy to increase its cable manufacturing facilities. The new installation will greatly expedite the manufacture and shipment of cable to the fast-growing shipbuilding industry of the West Coast. This will be G-E's first cable manufacturing plant West of the Rockies.

● PETITIONS of both Pacific Gas and Electric Company and the Sacramento Municipal Utility District for rehearings in the recently decided valuation case have been denied by the California Railroad Commission. PG and E held in its petition that the commission had failed to consider all facts in setting a value for the portion of its distribution system which the district seeks to condemn. The district contended that the $11,632,000 value found by the commission was too high. The matter now goes before the federal courts.

Flood casualty YESTERDAY

OK'd for Service on the Production Front Today

FLASH FLOODS "SOMEWHERE IN U.S.A." 48 TONS OF ELECTRICAL EQUIPMENT WATER-SOAKED, UNFIT FOR SERVICE. RUSHED TO WESTINGHOUSE MANUFACTURING & REPAIR PLANTS, DRIED IN ELECTRIC OVENS, RECONDITIONED, INSPECTED, TESTED...WITHIN 24 HOURS MANY OK'd MOTORS WERE ON THE RETURN TRIP—WITHIN 10 DAYS ALL EQUIPMENT RESTORED TO SERVICE.

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IF **THE EQUIPMENT NEEDING REPAIR IS VITAL TO THE WAR EFFORT . . . PHONE THE NEAREST OFFICE OF WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY FOR**

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33 M & R PLANTS . . . ONE NEAR YOU!

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Send for Catalogue

We have been making safety tools for 26 years

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● UNPRECEDENTED development in northern B.C. and Alberta following the opening of the Alaska Highway has resulted in start on development of a new temporary power plant project. Canadian Utilities Ltd., Calgary Alta., is erecting a new diesel plant at Fort St. John.

The firm is moving a 112½-kva. generator, two automatic diesel engines with clutches and V-belt drive and a used switchboard to St. John and installing them in a new power plant under construction at Fort St. John at a cost of approximately $12,000. A transmission line also will be built.

Gardner Transformers Designed for Easy Installation in the Field

Above right—600 KVA, 3-phase, 2400/4160 Y volts to 240/480 volts; left—450 KVA, 3-phase, 2400/4160 Y volts to 120/240 volts. Cover plates of terminal boxes have been removed in above illustration.

YOUR operating conditions easily solved with Gardner "Built-to-order" transformers. Design incorporates roomy split terminal boxes with pot-heads supplied on the primary side and cable terminators on the secondary side for quick and easy connection in the field.

Under the worst hazards—high temperatures, dangerous lightning storms—Gardner Transformers are dependable, economical in performance. The name GARDNER is your guarantee of trouble-free operation.

Write today for complete information.

Gardner Electric Mfg. Co.
4227 Hollis St. **Emeryville, Calif.**

MAYDWELL & HARTZELL
INCORPORATED
SAN FRANCISCO LOS ANGELES PORTLAND

PEOPLE
made this news

J. A. Krug Appointed WPB Power Director

J. A. Krug has been named to a newly created Office of Power Director by WPB Chairman Donald Nelson, in which he will have complete responsibility for electric power, water, gas and communications within the WPB. All functions and responsibilities of the facilities and resources bureaus and agencies insofar as they deal with these services also center in the new office.

Krug, one time TVA official, originally headed the WPB power bureau, and since then has held various positions in the war board set-up. He will report directly to Nelson on all matters of policy. Approval of projects, allocations of materials and allocations and rationing of utilities' services will be under his direction.

● HAROLD J. MERILEES, head of the dealer relations department of the merchandising division of the B. C. Electric Railway Co. at Vancouver, B. C., has been granted leave of absence for the duration by his company and has been appointed organizer for the Vancouver division of the National War Finance Committee. He has been active in business and service club circles and has been with the B. C. Electric in dealer relation and sales promotion work for the past 12 years. Recently he was appointed supervisor of accident prevention by the company. He is a member of the executive of the Advertising Sales Bureau of the Vancouver Board of Trade.

● ROBERT SIBLEY, former president of McGraw-Hill Co. of California and one-time editor of the *Journal of Electricity* (now ELECTRICAL WEST) is directing the American Alumni Council in a program of special war service. For 20 years executive manager of the California Alumni Assn., Sibley is serving now as president of the national alumni group, embracing more than 400 associations.

● ELECTED to the executive committee of the National Safety Council, Public Utilities Section, were A. A. KLINGE, Public Service Co. of Colorado, and W. L. SMITH, Los Angeles Department of Water & Power. Klinge is on the News Letter committee and Smith the program committee.

● W. F. GRIMES, formerly commander in the Communications Branch, 11th Naval District at San Diego, is now a captain in the Navy.

Three City Light Veterans Retire At Seattle

Seattle City Light will lose three of its principal officials by retirement during the early part of 1943.

W. J. McKeen, assistant superintendent of City Light and connected with the project virtually since its inception in 1904, leaves the service in February; T. F. Kane, superintendent of generation at the Skagit and connected with the project since 1905, leaves during the year. Both were close personal friends and co-workers of the late J. D. Ross, "father" of City Light.

George Holmes More, hydrographer with the Skagit since 1908, also will retire.

● APPOINTMENT OF ROBERT S. SLOAN as welding specialist in the North Pacific area has been announced by Westinghouse Electric & Mfg. Co. A native of Washington, Sloan joined Westinghouse in 1930 as a student engineer and most recently has been located at San Francisco and Los Angeles as appliance supervisor. In his new post he will work with plants in Washington, Oregon, Northern Idaho and Montana.

● R. R. ROBERTSON, design and construction engineer for the Los Angeles Department of Power & Light, will receive the Distinguished Flying Cross on behalf of his son, Lt. John M. Robertson, U. S. Naval Reserve. Lt. Robertson was reported "missing in action" last March, after he had sunk a Japanese transport in the Netherlands East Indies area.

● NORMAN L. BOST, Northwest manager for the National Electric Product Corp. in Seattle, has been commissioned a captain in the Signal Corps and will go to Fort Monmouth, N. H., for officers training. Bost, a veteran of the Argonne in the last World War, was past president of the Electric Club of Washington, and a member of the board of trustees.

● APOLOGIES TO CAPT. EUGENE BRAUN, vice-president of Maydwell & Hartzell, San Francisco and now on active duty with the Army Signal Corps. In a personal item in the December ELECTRICAL WEST, typesetters garbled his name beyond recognition; proofreaders failed to correct.

● WILLIAM H. HEROLD, Ft. Morgan, Colo., electrical inspector for 26 years, retired from active work as the result of injuries suffered fighting a fire. He was past chairman of Rocky Mountain Chapter, IAEI. He remains in the electrical business in Denver with his father.

ARMY E NAVY

The new Ward Leonard 4-inch Pressed Steel Rheostat offers the happy combination of a small sturdy power rheostat with a large number of steps and ample current carrying capacity. Like all Ward Leonard Pressed Steel Rheostats this model may be arranged for front of board, rear of board and multiple assembly mounting. Other types and sizes also available. Send for descriptive bulletins.

Western Representatives

A. R. Slimmon & Co., 445 East Third St., Los Angeles, Calif. Raymond Ackerman, 318 Dooly Block, Salt Lake City, Utah. Electrical Material Co., 163 Second St., San Francisco, Calif. Northwestern Agencies, 2411 First Ave., Seattle, Wash.

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Electric control (WL) *devices since 1892.*

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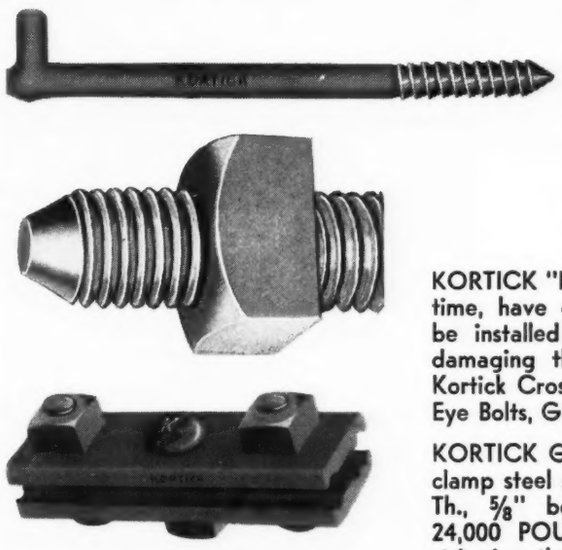

KORTICK IMPROVED POLE STEPS—1/2" drive head, strong cross section, driving surface centered—blow force reacts directly to point, reinforced bottom, no bending or distortion while driving, Fetter drive threads.

KORTICK "HANDIPOINT" BOLTS save time, have greater salvage value, can be installed quickly, removed without damaging threads. Supplied on ALL Kortick Crossarm Bolts, Carriage Bolts, Eye Bolts, Guy Rods.

KORTICK GUY CLAMPS—heavy type clamp steel section I 21/32" W. x 3/8" Th., 5/8" bolts, minimum tensile pull 24,000 POUNDS without breaking or stripping threads.

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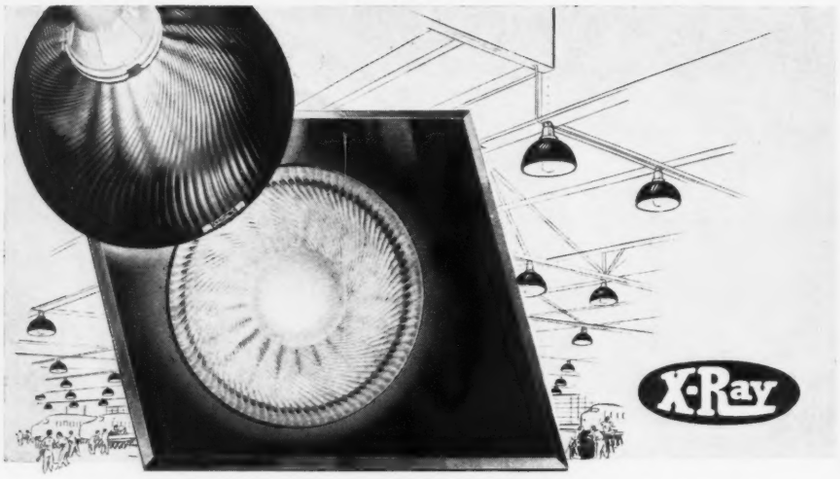

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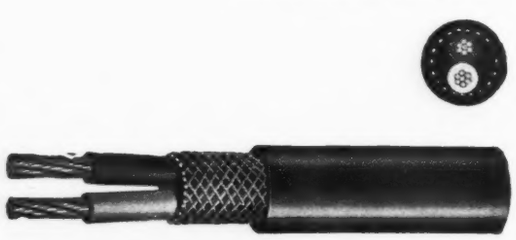

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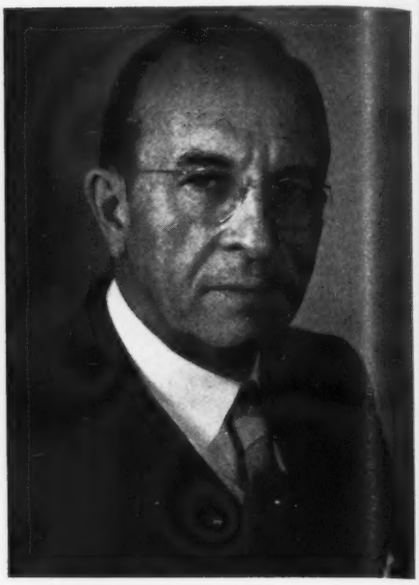


Answer to "Who Am I?"

(See Page 96)

Charles A. Dostal

Electriquiz Answers

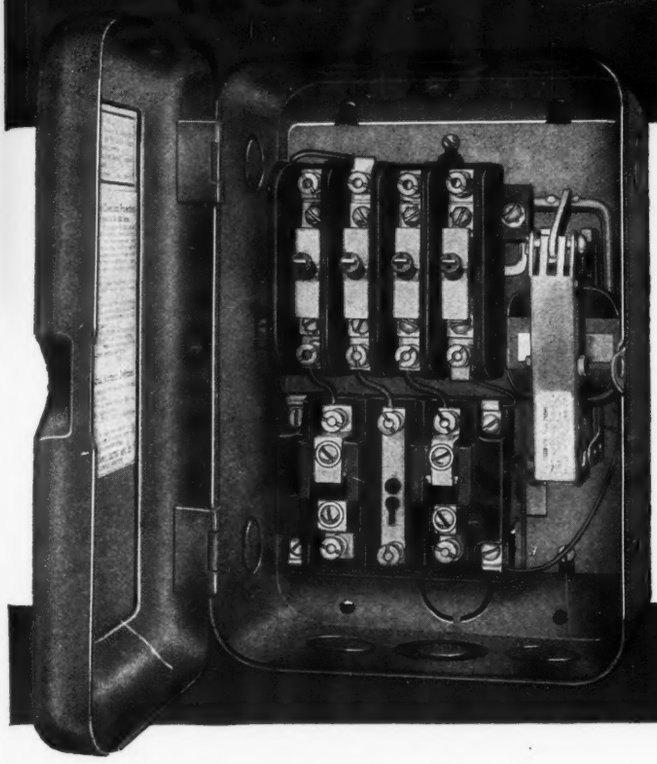
1. According to C. M. Ripley, the power of an average man is about 35 watts. Therefore it would require about 28½ man-hours of work to equal one kilowatt hour. At 50c per hour, the cost would be $14.25.
2. About 2,857,000 persons working continuously, or 11,428,000 on a 40-hour work basis.
3. One footcandle.
4. (b) $3. Ref. FPC Statistics, Electric Utilities in U.S. 1940. Estimates for 1942 show this approximately reversed.
5. (b) 1.5%. Page 856, Dec. 17, 1942, *P.U.F.*
6. (d) Four billion. *Electrical World*, Dec., 1942.
7. (b) 9%.
8. (b) 25c.

● G. G. (NICK) CARTER, JR., G-E Lamp Dept., Los Angeles, is a first lieutenant in the Signal Corps. He left Dec. 23 for Fort Monmouth, N. J., where he was to spend a month before being transferred elsewhere.

● HAROLD HUGGINS, Hotpoint representative at Los Angeles, has been assigned to an anti-aircraft unit of the C.A.C. at Camp Callan. He holds the rank of lieutenant.

● RAY U. MUFFLEY, Puget Sound Power & Light Co., Seattle, has been re-named chairman of the 1943 "Fight Infantile Paralysis" campaign.

magnetics"



1. **STRAIGHT THRU WIRING**—line and load in same relative positions at top and bottom. No confusion.
2. **FRONT MOUNTING OF PARTS**—contacts always visible—never any question about proper contacting, nor danger to motor because of single phasing.
3. **EASE WITH WHICH CONTACTS CAN BE CHANGED** even by unskilled worker—no manipulations by expert mechanic necessary.
4. **NEVER HAS HAD TROUBLE WITH BURN-OUTS ON MOTORS**—one type he used "burned out five motors."
5. **OVERLOAD RELAYS ARE "HONEST"**—always trip on overload as claimed—he has used heaters whose performance has not been in accordance with calibration.

ADDED FEATURES OF "CM"

REMOVABLE INTERIORS: The entire mechanism is mounted on a steel back plate (aluminized finish) and can be removed as a unit by loosening three non-removable screws—for ease in wiring line and load.

SHOCK ABSORBING ARMATURE MAGNET ASSEMBLY: This shock-absorbing, self-aligning mechanism prevents hammer blows as the starter closes—assures long life, eliminates humming and minimizes coil maintenance.

SOLDERLESS LUGS: Sizes 0 and 1 are equipped with special "wire keepers", grooved on the inside to hold wire rigidly in place. Sizes 2 and 3 have Trumbull solderless "Handi-Lugs."

INTERCHANGEABLE RELAY HEATERS: All relay heaters, ½ to 80 amp., are interchangeable. Automatic reset standard, or hand reset on request.

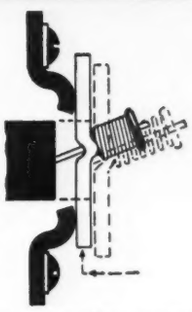
For long life and complete overload protection under severe load conditions specify Trumbull "CM" Magnetic Starters. *Ask for Circular No. 322 and Bulletin No. 404.*

VERTICAL CONTACTS

Pioneered by Trumbull

The Trumbull line of motor starters, both manual and magnetic has long been recognized as a major contribution to the Industry.

One of the best electrical and mechanical devices—Trumbull's vertical, sliding, self-wiping, double-break contact *was introduced by this company in 1927* and has been most effective because it keeps the contact . . .



DUST AND CARBON FREE

at all times. Note the vertical sliding action shown in the accompanying drawing, which wipes the metal clean at every operation of closing and opening the circuit. Non-carbonizing glazed porcelain bases also prevent accumulation of both dust and carbon.

AVAILABLE in Sizes 0 ("M"-2), 1 ("CM"-7½), 2 ("CM"-25) and 3 ("CM" - 50).

May be operated by either *remote, local or automatic control.* Also in combination with motor circuit disconnects, contactors and other equipment.

TRUMBULL

MAGNETIC STARTERS

THE TRUMBULL ELECTRIC MANUFACTURING COMPANY • PLAINVILLE, CONN. • A GENERAL ELECTRIC ORGANIZATION

OTHER FACTORIES AT NORWOOD (CINN.) O. — SEATTLE — SAN FRANCISCO — LOS ANGELES

Edison Company Employees Given New Responsibilities

A number of Southern California Edison Co. district managers began duties in new fields Jan. 1.

William P. Graef is now an executive assistant of the company, remaining as special representative of the management in Long Beach where he has been district manager for 13 years.

John H. Mead, former assistant district manager at Long Beach, is now district manager.

H. A. Brody, former Montebello district manager, is district manager at Huntington Park, succeeding A. I. Whitehead, who retired.

P. V. Moffat, former Redlands district manager is now district manager at Montebello.

H. J. Moulton, former San Bernardino district manager, is now district manager at Redlands.

R. J. Doyle, former San Bernardino assistant district manager, is now district manager.

● ALBERT A. CLARK has been named Santa Rosa district manager for Pacific Gas and Electric Co., succeeding the late W. W. Shuhaw. A native Californian, he entered PG and E service in 1917 as a groundman, becoming district agent at Newman in 1921 and at Lodi in 1937.

● JOHN J. FISKE has been transferred by Westinghouse Electric & Mfg. Co. to the Los Angeles area as electronic control specialist. Born and raised in California, he has been at East Pittsburgh since graduation from the state university in 1941.

● DAVID S. BROMLEY has resigned from the California Electric Power Co. organization to become personnel director for the U. S. Vanadium Mining Co. near Bishop, Calif. He had served the power company at Brawley in the Imperial Valley and at Bishop.

● HENRY B. HARDIN has been appointed assistant to the vice-president of Puget Sound Power & Light Co. He was advanced from his former post of assistant to the general superintendent.

● MAX MCGRAW, president McGraw Electric Co. of Chicago, Ill., was elected president of National Electrical Manufacturers Assn., recently at the annual meeting of the association in New York.

Two-thousandth Pacific Gas and Electric Co. employee to join the military forces was Violet M. Hooe, secretary in the Oakland office. Miss Hooe is one of the first two in the Twelfth Naval District to be accepted into the Spars, women's branch of the U. S. Coast Guard

Canadian Group Names Officers For Year

W. N. Kelly recently was elected chairman of the Vancouver, B. C., branch of the Engineering Institute of Canada. T. V. Berry was named vice-chairman and P. B. Stroyan, secretary-treasurer. A. Peebles is branch news editor. Members of the executive committee are: J. P. Fraser, R. E. Potter, E. S. Jones, H. P. Archibald, I. C. Barltrop and H. J. McLeod. Percy Buchan is auditor.

Those named on the 1943 nomination committee were W. N. Kelly, W. C. Scott, and Chris Webb.

The Institute medal for the year was awarded to C. Gordon Rogers of the University of British Columbia, and in his absence was presented to Dean Finlayson of the U.B.C.

● J. M. ZIMMERMAN has been named staff manager for the Pacific Coast District manufacturing and repair department by Westinghouse Electric & Mfg. Co. With headquarters at Emeryville, Zimmerman will supervise repair activities, pricing and contracts at plants in California, Oregon, Washington and Utah. A lawyer as well as electrical engineer, he comes to the coast from Chicago.

● FRANCIS K. FOX, engineer in General Electric's San Francisco district, is now a lieutenant in the Civil Engineer Corps, USNR.

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THE POPULAR TIME SWITCH LINE KNOWN EVERYWHERE

NOW—lower prices and higher capacities

There is a Tork Clock for every regular switching job: 60 minute, 4 hour or daily cycles.

Bulletins on request

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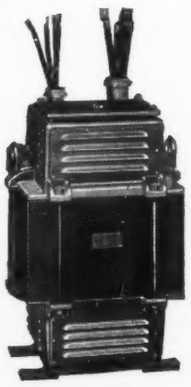

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When you are installing or re-arranging—and need a special transformer to exactly match your requirements—call on us. We can deliver in a week to 10 days.

Specify scattered transformers to eliminate duplicate conduit runs and save on power costs.

JEFFRIES TRANSFORMER COMPANY
1710 E. 57th St. Los Angeles, Calif.

C. E. Young Retires; Had Served PG and E Since 1906

Charles E. Young, assistant engineer of operation of Pacific Gas and Electric Co., retired Jan. 1, after continuous service with the company since 1906. A native of Santa Cruz County, California, Young's interest in electricity was inspired by early study of telegraphy.

After experience in Sierra lumber camps and a mine at Park City, Utah, he came to San Francisco in 1897 to study electrical engineering at Heald's College. While studying, he taught telegraphy two nights a week and high school physics and mathematics two additional nights, although he had never attended high school himself. He was with two of the early utility companies in San Francisco before joining the PG and E at Marysville as a foreman. He was superintendent six years before coming to the general office operating department.

R. R. Cowles Appointed To Succeed Charles Young

R. R. Cowles has been appointed assistant engineer of operation of Pacific Gas and Electric Co., succeeding C. E. Young. Cowles is a native of Michigan and a graduate of the University of California, where he captained the 1909 track team.

His PG and E career began in 1910 when he went to work for the Oakland Gas Light and Heat Co. In 1913 he was made assistant superintendent of the East Bay department of PG and E. He came into the general office engineering department in 1921. He is active in Masonic orders and has held various important committee positions in the Pacific Coast Electrical Assn.

● T. H. CROSBY, district manager Canadian Westinghouse Co., Vancouver, B. C., has been appointed a member of the executive of the Association of Professional Engineers of British Columbia. The appointment was made by the provincial government through an order-in-council.

● E. M. MEYER, design engineer for Victor Insulators, Inc., Victor, N. Y., was in the West last month, visiting Pacific Coast offices of Maydwell & Hartzell, Inc., manufacturers' representative.

● PUGET SOUND POWER & LIGHT Co. has named Kenneth B. Panchot local manager at Tacoma. Panchot joined Puget Power at Chehalis in 1940 following seven years with Pacific Power & Light Co.

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California's Oldest National Bank
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ONE MONTGOMERY STREET

OIL CIRCUIT BREAKERS

GOOD AS NEW

For Sale To Authorized Purchasers

2—3000 A. 15 KV, 3 P.S.T. Westinghouse, Deion grid, 60 cycle, type 0-22A with tank lifter.

1—3000 A. 15 KV 3 P.S.T. General Electric type F, form H6, DC motor operated.

●

SAN DIEGO GAS & ELECTRIC CO.
861 Sixth Avenue
San Diego, California

This family head is already planning

AMERICA'S AFTER-VICTORY HOME...

HE ISN'T WORRIED much about the placing of the rooms. He's willing to leave that kind of thing to the architects. But one thing he's going to insist on, or his name isn't Electronics—that America's new homes take advantage of every electrical time- and trouble-saver that America's creative ingenuity can produce!

He's going to give us completely new lighting, and he's going to switch it on and off for us, regulate its intensity. He's going to give us radio and television communication with our neighbors and with the world. He's going to control our high-frequency heating systems, our automatic door openers, our ventilating and air conditioning units . . .

Are you planning now to supply the tremendous *extra* load of electric power this family head is going to demand? If you are, if, you, too, believe that domestic consumption of power is due for an upsurge once this war has been won, you'll find a sympathetic ear for your plans in Roebling's Engineering Department and Development Laboratories.

For Roebling, too, is planning toward that end, with a complete line of electrical wires and cables that includes magnet wire and coils, portable cords and cable, signal wire and control cables, weatherproof wires and a wide variety of power and lighting cables . . . More than this, Roebling is planning now for the production of new types of conductors and insulations and coverings as these are required by the changing electrical industry.

For today's needs and tomorrow's plans, rely on Roebling as your source for electrical wires and cables.

JOHN A. ROEBLING'S SONS COMPANY
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ROEBLING

ELECTRICAL WIRES AND CABLES

R. W. Beard Transferred To Schenectady Post

R. W. Beard, with General Electric's San Francisco office since 1925, has been appointed assistant to the manager of that company's lighting department in Schenectady.

In San Francisco Beard spent two years as arc welding and industrial heating specialist, then was assigned to building and heavy construction, working on many important traffic safety and other lighting jobs. His new duties make him responsible for distribution of army and navy searchlights, protective lighting equipment, lighting for airports, traffic control and accessory devices.

R. H. Bing B. C. Electric Veteran, Dies in Vancouver

Rupert H. Bing, 61, chief clerk of the light and power department of the British Columbia Electric Railway Co. at Vancouver, died suddenly in that city. He joined the B. C. Electric in 1909 as application clerk, coming from London, England, and rose in 1919 to the post of chief clerk.

Mr. Bing served in the South African war and was an active member of the South African Veterans' Assn., and of the Canadian Legion. He also was active in Masonic circles, and was past president of the B. C. Electric Head Office Employees' Assn. He organized and acted as secretary of the B. C. Electric War Comforts Committee started with the outbreak of this war. Mr. Bing is survived by his wife, and one son, Stuart R. Bing, serving overseas with the R.C.A.M.C.

● JAMES JOSEPH O'REILLY, 56, credit manager of Graybar Electric Co., Los Angeles, for the past 17 years, died suddenly of a heart attack in his office Dec. 30. He had served with Graybar for the past 35 years, working in Cincinnati and Seattle previous to joining the Los Angeles office in 1925. Surviving are his wife, a daughter and a son, a naval aviation cadet stationed at Livermore.

● W. I. POWELL, merchandise sales manager for Westinghouse Electric Supply Co. in Northern California, died at San Francisco on Dec. 12. He was with Manhattan Electric Co. of San Francisco when that company was taken over by Westinghouse Supply in 1923. He was subsequently Wesco salesman, refrigeration specialist and refrigeration sales manager. He had been in his present position for almost 10 years.

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SPEED WAR WIRING

No time to lose when you wire war plants and homes—Avoid delays by using IDEAL "Wire-Nuts". Fast—Simple—Easy. Thread onto wires like a nut on a bolt. No solder, no tape.

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LEAD ANCHORS

For use in masonry or concrete. Fig. 900—available in 9 standard diams. from 6-32" to 5/8". Fig. 910—in 1/4", 3/8", 1/2" diams. in standard lengths on low priority.

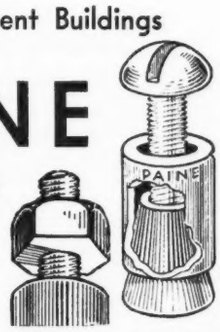

Fig. 910 Fig. 900

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FASTENING and HANGING DEVICES

S. P. Larsen Killed in Auto Accident January 2

S. P. "Si" Larsen, southern California district sales engineer for Hubbard and Company for the past nine years, was killed instantly Jan. 2 in an automobile accident near Riverside. Born in Neenah, Wis., in 1899, he began his career in the electrical industry with the Wisconsin Light, Heat & Power Company at Appleton. Later he became manager of Line Material Company in the Southern states.

Ultimately transferred to the Pacific Northwest, Larsen represented Line Material in Oregon, Washington, Idaho, Montana and British Columbia. In 1931 he joined the Hubbard organization as Northwest manager, transferring to southern California in 1933.

● WALTER EDGAR BROTHERS, since 1906 the city electrical inspector of Berkeley, Calif., died Monday, Jan. 18, following a heart attack of the previous week. Born Feb. 8, 1875, in Milton, Canada, he came to Berkeley in 1904, worked first as a fireman and city electrician and in 1906 became full-time city electrician.

● FRANK A. STEEL, for the past two and a half years electrical superintendent for Siems Drake Puget Sound at the Naval Air Station at Kodiak, Alaska, died there recently after a brief illness. Mr. Steel was born in Scotland 62 years ago, and had been in Seattle for many years.

● R. R. DINSMORE, commercial engineer in California Electric Power Co.'s Riverside office, died Nov. 30 following a heart attack. Mr. Dinsmore joined the power company in 1919 after service in World War I. First at Brawley and later at Randsburg, he had been in the Riverside office for 15 years.

● CARL G. KOPPITZ, vice-president and consulting engineer of the Railway and Industrial Engineering Co., South Greensburg, Pa., died Jan. 6. He was a native of San Francisco and started his electrical career as an operator in an early California hydro plant.

● D. W. STANDROD, a director of Idaho Power Co. since its organization, died Dec. 21 at Pocatello. He was 84 years old and at the time of his death had made plans to attend a power company board meeting in Boise.

● JOSEPH DENNIS BUTLER, for 21 years with Pacific Gas and Electric Co. in its claim department as commission attorney, died suddenly, age 48, Jan. 8.

● JOHN A. MEYERS, electrical contractor at Dixon, Calif., died Jan. 17 following a heart attack.

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PROFILES *of the month*

Right: First aid training saved a life in the Utah Power & Light organization recently. J. Hyde Stayner (left), meter department foreman, resuscitated Clarence F. Grant, meterman, after he had come in contact with a conductor. Below: Charles E. Moore (center) president of Joshua Hendy Iron Works, Sunnyvale, Calif., with managers of the two plants recently absorbed by his firm: A. J. M. Baker (left), Crocker-Wheeler Division, and G. A. McKenna, Pomona-Wesco Division, newest division created by acquiring Pomona Pump Co.

David Hall, Westinghouse engineer at Los Angeles, retired last month following 34 years with the company. He is pictured (below center) at the party given for him by Los Angeles associates. With him are Ralph A. Hopkins (left) central station division supervisor, and A. W. Copley, Pacific Coast manager of engineering for Westinghouse. The electric drill and grinder was a present from the group

Our 2000th is a Woman

SINCE PEARL HARBOR more than two thousand proud "good-byes" have been said to employees of this Company entering the military services.

Early this month it was "good-bye and good luck" to Miss Violet Hooe of the Service Department in Oakland. When Miss Hooe enlisted in the SPARS—United States Coast Guard—she became the two thousandth employee to join up.

In July, 1942, William J. Hickey, steam plant engineer, changed to Navy blue as Boatswain's Mate—Second Class. At that time he was the thousandth employee who had gone to war.

Two thousand young men and women means at least one out of every six of this company's employees are now on war duty. Two thousand means an average of one hundred and fifty employees each month have gone "on assignment" to the most important job in the world today.

Good-bye and good luck. When the job of beating the Axis is finished—come back to us. Your service record, your job seniority and your interests in the company's old-age retirement plan will be preserved intact and waiting for you. That is the farewell pledge of your company.

P·G·and E·

PACIFIC GAS AND ELECTRIC COMPANY

TRAIN YOUR SIGHTS ON 194_

Through the smoke of battle the gunner must somehow keep his sights on the target. It isn't much different in running an electrical business. Through the confusions and restrictions of war, sights must be kept on the target of tomorrow.

You can see this target if you have only the barest inkling of what our scientific men and production engineers are accomplishing under the impetus of war. It's no secret for example that 25-pound air conditioning units have been developed to cool the bake ovens we know as tanks. Think of how these can be used once the war is over.

Consider the vast new knowledge being gained from the radar and other electronic devices and how we can exploit this knowledge to raise our peacetime standards of living.

Imagine the future in communications with full-color television, not to mention the war-born simplifications in wiring and fittings and the compact, prebuilt kitchens, laundries and entire homes that will make American housing a tremendous new market for materials, labor, merchandise and skill.

This is our target! A day probably not far distant when the war will end and reconstruction can start. A day when the secrets being held in trust by the electric industry can be revealed and put to work for all mankind.

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